THE MARINE REVIEW

VOL. 44 | CLEVELAND | JANUARY, 1914 | NEW YORK | No. 1

Ship Building on the Lakes

The 1914 Program Shows That the Ship Yards Have a Wide Variety of Craft, Including Seven Bulk Freighters

THE ship yards of the Great Lakes have under construction 26 vessels for 1914 delivery. The list includes seven bulk freighters, three passenger steamers, two car ferries, one self-unloading steamer, one lumber steamer for the coast, one fruit steamer for the coast, one tug, one buoy steamer and nine scows. Of this program the American Ship Building Co. is building six, the Great Lakes Engineering Works six, the Collingwood Ship Building Co. three, the Manitowoc Ship Building & Dry Dock Co. one, the Polson Iron Works seven, the Kingston Ship Building Co. two and the Marine Iron Works one.

Again subdividing the program the American Ship Building Co. is building five bulk freighters and a passenger steamer; the Great Lakes Engineering Works two car ferries, a conveying steamer, a lumber steamer for the coast, a passenger steamer and a bulk freighter; the Collingwood Ship Building Co. is building a bulk freighter, a passenger steamer and a dump scow; the Manitowoc Ship Building & Dry Dock Co. a tug; the Polson Iron Works a buoy steamer and six hopper scows; the Kingston Ship Building Co. two dump scows, and the Marine Iron Works a fruit steamer.

The seven bulk freighters included in this construction program have a carrying capacity of 67,000 gross tons on a single trip, though as two of them are being built in Canadian yards, they will not be available for the ore trade of the Great Lakes. The net increase in the ore carrying trade is, therefore, 45,000 tons per trip. The wastage of bulk freighters caused by the elements during 1913 works out at about 92,919 tons per trip. The available carrying capacity of the fleet at the opening of navigation in 1914 will, therefore, be about 50,000 tons per trip less than it was at the opening in 1913, provided, of course, that all the vessels concerned in this program are ready to go into commission when navigation opens.

Exclusive of Canadian tonnage, 32 vessels were launched on the Great Lakes during 1913. This list includes four bulk freighters, five oil tankers (two steamers and three barges) one repair ship, four tugs, two passenger steamers, two lighters, one drill boat, one paddle-wheel steamer, one sand steamer, one car ferry, two car floats, five dredges, one ferry steamer, one supply boat and one scow. Of this program the American Ship Building Co. built 16, the Great Lakes Engineering Works seven, the Manitowoc Ship Building & Dry Dock Co. six, the Toledo Ship Building Co. one, and the Cowles Ship Yard Co. two. In addition, the Great Lakes Engineering Works launched four barges on the Lake Borgne canal.

Three of the bulk freighters included in the 1914 program are intended to replace a part of the wastage caused by the great November storm. While the program of new construction is not heavy, the ship yards are, nevertheless, assured of plenty of work, as the November storm threw a great many vessels upon the beach and practically made a visit to the ship yard necessary for every vessel that was out in it, as they were all pretty thoroughly shaken up and damaged in the heavy seas.

Considerable remodeling of the older type of craft is also going on to conform to modern conditions of loading and unloading, as the less obstruction there is in the hold the faster the machines can work. Experience proves that it pays to remodel these older vessels.

An analysis of the situation shows that the position of the vessel owner on the Great Lakes is steadily being strengthened. During the past three or four years the building of bulk freighters has been cautious as it was quite apparent in 1910 that a surplus of ships existed on the lakes, due to the fact that promoters had entered the trade and were building ships for which no real need existed. Ships, however, do not reproduce themselves, but are, on the other hand, subject to an inevitable wastage through the vicissitudes of navigation. The result is that the lake fleet today available for bulk freight purposes is only 50,000 tons greater in carrying capacity per trip than it was four years ago, while the trade itself has greatly expanded, every feature of it, ore, coal and grain, showing large increases, and proving quite conclusively that the United States is a fast growing nation. The time is coming, and fast coming, when the coal trade on the lakes will equal that of the ore trade. As the northwest expands, additional quantities of coal will be required in that territory and as population increases, shipments of grain will become heavier and heavier. In fact, it is very wonderful how the grain trade has developed within a very few years. The movement of 1912 was almost double that of any preceding year, while 1913 is a substantial increase over that of 1912. The lakes have rarely enjoyed a better season than has marked 1913, though the general lassitude of the country in other directions and the uncertainty surrounding industry somewhat took the zest out of it during the closing months.

The lakes are assured of their trade. The dominant commodities are such that they cannot be moved as cheaply in any other way and if they are not moved by the ships they are not moved at all. Ship building, ship repairing and ship owning will always be fairly profitable enterprises on the lakes, having lean years, of course, but averaging well throughout the decade.

It is regrettable that there is little encouraging to report about the coast yards. It would seem as though the proximity of the opening of the Panama canal would have stimulated ship building in both Atlantic and Pacific ship yards, but the returns do not indicate that it has. In fact, only two vessels can be directly attributed to the construction of this great ditch. Of course, a few vessels are building for coastwise service, but they would probably be built anyhow. This condition may be due to the fact that congress has closed the canal to railroad-owned ships. There is some reason to believe that the Southern Pacific and the Great Northern would have placed orders for ships to utilize the great waterway if they had been permitted to do so. At any rate, it is quite clear that independent interests are exhibiting no eagerness to take advantage of the commercial opportunities afforded by the canal. It is clear, therefore, that whatever ships utilize this waterway will be existing vessels and not those that have been brought into being by reason of it. It may be several years before the canal will by reason of its existence cause the development of a large fleet of American ships. It will all depend upon the commerce offering. It was not expected that the commerce of the canal would be very large for a few years to come, but it certainly was expected that its completion would be awaited by some fine new steamers that were especially constructed to take advantage of it.

Of course, all that is said in the foregoing has to do solely with commerce. There is no doubt that as a means of national defense the Panama canal is worth to this country all that it has cost. It may never be used strategically at all, probably never will be, but there is solid satisfaction in the fact that it exists. Our splendid isolation makes a foreign war on American soil an impossible thing, but if circumstances should ever develop whereby the mobilization of the entire fleet should be required on the Atlantic or Pacific coasts, the canal will prove a wonderful military aid.

VESSELS UNDER CONSTRUCTION IN LAKE SHIP YARDS FOR 1914 DELIVERY

To be built at	Type or name.	Dimensions in feet. Over all.	Keel.	Beam.	Depth.	Dimensions of engines, in.	Dimensions of boilers, ft. and in.	Draft.	Steam pressure, lbs.	Capacity, gross tons.	For whom building.
AMERICAN SHIP BUILDING CO., CLEVELAND, O.											
Port Arthur.	Pass. Str. Noronic	385	362	52	28.9	29½, 47½, 58, 58 x 42	(4) 15.6 x 11.6	Howden	200	.....	Northern Nav. Co., Ltd., Collingwood, Ont.
Port Arthur.	Bulk Frtr.*	625	604	59	32	24, 39, 65 x 42	16.0 x 11.6	Ellis & Eaves	170	12,000	Norcross Interests, Toronto, Ont.
Lorain......	Bulk Frtr.	524	504	54	30	22½, 36, 60 x 42	13.9 x 11.6	Ellis & Eaves	180	9,000	A. T. Kinney, Cleveland, O.
Wyandotte..	Bulk Frtr.	257	244	43	23	18, 29, 48 x 40	12.0 x 11.6	Howden	170	3,000	George Hall Coal Co., Ogdensburg, N. Y.
Cleveland...	Bulk Frtr.	524	504	54	30	23½, 38, 63 x 42	15.4½ x 11.6	Ellis & Eaves	180	9,000	W. C. Richardson & Co., Cleveland, O.
Lorain......	Bulk Frtr.*	524	504	54	30	23½, 38, 63 x 42	15.4½ x 11.6	Ellis & Eaves	180	9,000	Va. Steam'p Co., M. A. Hanna & Co., mgrs., Cleveland
GREAT LAKES ENGINEERING WORKS, DETROIT, MICH.											
Ecorse......	Car Ferry	350	338	56	20.6	(2) 19½, 31, 52 x 36	4 Scotch 13.2 x 12.0	Positive heated	175	.....	Grand Rapids & Northwest'n Ry. Co., Ludington, Mich.
Ecorse......	Car Ferry	350	338	56	20.6	(2) 19½, 31, 52 x 36	4 Scotch 13.2 x 12.0	Positive heated	175	.....	Grand Rapids & Northwest'n Ry. Co., Ludington, Mich.
Ecorse......	Self-unloading Str.	439.3	416	58	30	19½, 28¼, 41, 60 x 42	2 Scotch 14.9 x 12.0	Positive heated	215	7,500	Wyandotte Transportation Co., Detroit, Mich.
Ashtabula...	Lumber Str.	282	274.3	43.6	22.3	18¾, 31½, 54 x 40	2 Scotch 13.9 x 11.6	Positive heated	190	3,000	Atlantic Coast Interests.
Ecorse......	Pass. Str. S. American	314	291	47	18	21½, 30¾, 44½, 64 x 36	3 Scotch 14.0 x 12.0	Positive heated	215	.....	Chicago, Duluth & Georgian Bay Transit Co., Chicago
Ecorse......	Bulk Frtr.*	524	504	54	30	23½, 38, 63 x 42	15.4½ x 11.6	Positive heated	180	9,500	Mahoning Steam. Co., M. A. Hanna & Co., mgr., Cleve.
COLLINGWOOD SHIP BUILDING CO., COLLINGWOOD, ONT.											
Collingwood.	Bulk Frtr.	550	529	58	31	24, 40, 66 x 42	13.0 x 11.0	Howden	185	10,000	St. Lawrence & Chicago St'm Nav. Co., Toronto, Ont.
Collingwood.	Steel Dump Scow	130	...	30	11	....	....	....	...	.....	Toronto parties.
Collingwood.	Pass. and Pack. Frtr.	146	137	24	11.3	12½, 21, 34 x 21	12.6 x 11.0	Natural	185	.....	Pelee & Lake Erie Nav. Co., Pelee Island, Ont.
POLSON IRON WORKS, TORONTO, ONT.											
Toronto.....	3 Hopper Scows	144	...	31	11.6	....	....	....	...	500 cu.yd.ea.	Quebec Harbor Commission
Toronto.....	3 Hopper Scows	108	...	28	9	....	....	....	...	300 cu.yd.ea.	Quebec Harbor Commission
Toronto....	Buoy Str.	164.6	155	30	13	14, 22½, 38 x 24	10.0 x 11.0	Howden	180	102	Canadian government.
KINGSTON SHIP BUILDING CO., LTD., KINGSTON, ONT.											
Kingston...	2 Steel Dump Scows	...	...	..	..	....	....	....	...	500 cu. yds.	Department of Public Works, Ottawa.
MARINE IRON WORKS, STATION A, CHICAGO, ILL.											
Chicago.....	———	116	...	28	19	9 x 48	48.0 x 14.0 loco.	Natural	170	80	Honduras Fruit Co.
MANITOWOC SHIP BUILDING & DRY DOCK CO., MANITOWOC, WIS.											
Manitowoc..	Steel Tug	90	80	22	13	17, 36 x 30	1 F.B Marine 10.6 x 14.0 Anthracite fuel.	Assisted	130	.....	Erie Railroad.

*Isherwood system of construction.

Merchant Work in Coast Yards

All of the Ship Yards Have Something to do but the Program is on the Whole Disappointing

HEREWITH will be found a summary of the more important ship building contracts under order of construction. Considering the proximity of the opening of the Panama canal it must be admitted that it is a rather disappointing program. Cramps are building two fine steamships which are probably intended for service through the canal, though no definite announcement has as yet been made of the interest for whom they are building; the Newport News Ship Building & Dry Dock Co. are building three steamers for the American-Hawaiian Steamship Co., which has for many years maintained an Atlantic-Pacific service and which will obviously use the canal; the Fore River Ship Building Corporation are building two steamers for the Emery Steamship Co., of Boston, which will be available for Panama canal service; and the Newport News Ship Building & Dry Dock Co. is building one steamer for the Matson Navigation Co., and two for the Mallory Steamship Co.—not an elaborate program for a country with the second longest coast line in the world and a population of 90,000,000 people.

Newport News Ship Building & Dry Dock Co., Newport News, Va.

Steel freight and passenger steamer Manoa, 446 ft. over all, for Matson Navigation Co., San Francisco, Cal.; gross tonnage, about 6,900; single screw engines, six Scotch boilers; estimated horsepower, 4,000.

Steel oil carrier J. D. Archbold, 474 ft. 6 in. over all, for Standard Oil Co. of N. J., New York, N. Y.; estimated gross tonnage, 8,000; single screw engines, three Scotch boilers; estimated horsepower, 2,800.

Steel freight steamer Neches, 420 ft. over all, for Mallory Steamship Co., New York; gross tonnage, about 5,800; single screw engines, four Scotch boilers; estimated horsepower, 4,100.

Steel freight steamer Medina, 420 ft. 9 in. over all, for Mallory Steamship Co., New York; gross tonnage, about 5,800; single screw engine, four Scotch boilers; estimated horsepower, 4,100.

Steel oil carrier J. D. Rockefeller, 474 ft. 6 in. over all, for Standard Oil Co. of N. J., New York, N. Y.; gross tonnage, about 8,000; estimated horsepower, 2,800; single screw engines, three Scotch boilers.

Maryland Steel Co., Sparrows Point, Md.

Steel freight steamer Washingtonian, 414 ft. 2 in. over all, for American-Hawaiian Steamship Co., New York; estimated gross tonnage, 6,649; quadruple, single-screw engines and three Scotch boilers; approximate value, $675,000; estimated horsepower, 4,000.

Steel freight steamers Iowan and Ohioan, duplicates of steamer Washingtonian, mentioned above, for American-Hawaiian Steamship Co., New York.

Four steel dump barges, duplicates, for Isthmian Canal Commission, Washington, D. C.; 160 ft. over all; approximate value, $65,000 each; estimated gross tonnage, 1,000 each.

Two steel lighters, P. R. R. No. 155 and P. R. R. No. 156, duplicates, for the Pennsylvania Railroad Co., New York; length over all, 120 ft.; approximate value, $75,000 each; estimated gross tonnage, 549; compound single-screw engine, one Scotch boiler; estimated horsepower, 345.

New York Ship Building Co., Camden, N. J.

Steam steel cruiser Fei Hung, 322 ft. over all, for Chinese government; 2,600 tons displacement; three Thornycroft watertube boilers; triple screw Parsons turbines; S. H. P., 8,300.

Steel battleship Moreno, 594 ft. 9 in. over all, for Argentine government; 27,630 tons displacement; 18 Babcock & Wilcox watertube boilers; triple screw Curtis turbines; S. H. P., 45,300.

Steel collier Hampden, 395 ft. 3 in. over all, for Coastwise Steamship Co.; single screw, triple-expansion reciprocating engines and two single-ended Scotch boilers; 2,100 I. H. P.

Steel steam municipal ferry, 231 ft. over all, for New York City; single screw (each end) triple-expansion reciprocating engine and three Babcock & Wilcox watertube boilers; 1,950 I. H. P.

Two steel car floats, duplicates, 292 ft. over all, for Long Island Railroad Co.

Steel car float, 256 ft. over all, for N. Y., P. & N. R. R. Co.

Steel car float, 268 ft. 3 in. over all, for N. Y., P. & N. R. R. Co.

William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.

Two express steamers, 524 ft. over all; estimated gross tonnage, 10,000; Parsons turbines, triple screw; 12 water tube boilers; estimated horsepower, 23,000.

One car ferry steamer, 350 ft. over all, for Florida East Coast Railway; three-cylinder twin screw reciprocating engines and four single ended Scotch boilers; estimated horsepower, 2,700.

Four coal barges, 110 ft. over all, 500 tons capacity, for quartermaster's department, United States government.

Harlan & Hollingsworth Corporation, Wilmington, Del.

Steel twin-screw steamer Narragansett, 332 ft. over all; estimated gross tonnage, 3,539; two four-cylinder triple-expansion engines; six main Scotch and one donkey boiler; estimated horsepower, 4,200.

Steel twin-screw steamer Manhattan, 332 ft. over all; estimated gross tonnage, 3,539; two four-cylinder, triple-expansion engines, six main Scotch and one donkey boiler; estimated horsepower, 4,200.

Double ended, all steel screw ferry boat Salem, 168 ft. over all; estimated gross tonnage, 774; three-cylinder compound engine; two Babcock & Wilcox boilers; estimated horsepower, 700.

Fore River Ship Building Corporation, Quincy, Mass.

Steel molasses steamer Amolco, for Boston Molasses Co., Boston, Mass.; length over all, 329 ft. 9 in.; estimated gross tonnage, 2,500; triple-expansion, single-screw engines, two Scotch boilers; estimated horsepower, 1,300.

Steel freight steamers Atlantic and Pacific, duplicates, for Emery Steamship Co., Boston, Mass.; length over all, 405 ft. 9 in.; estimated gross tonnage, 5,500; single screw, triple-expansion engines; estimated horsepower, 2,100.

Union Iron Works Co., San Francisco, Cal.

Steel tank steamer Frank H. Buck, 426 ft. 9 in. over all, for Associated Oil Co., estimated gross tonnage, 5,900; single screw, triple-expansion engines, 26½, 45, 75 x 48; four single-end Scotch marine boilers; estimated horsepower, 2,600; capacity, 62,000 barrels.

Steel tank barge No. 8, 116 ft. over all, for Standard Oil Co.; capacity, 2,060 barrels.

United Engineering Works, 224-232 Spear St., San Francisco, Cal.

Steel oil barge S. O. Co. No. 7, 160 ft. over all, for Standard Oil Co., San Francisco, Cal.; approximate value, $80,000; estimated gross tonnage, 450.

Wooden steamer Mary Olson, 202 ft. over all, for Hammond Lumber Co., San Francisco; estimated gross tonnage, 800; triple-expansion engines, 13½, 22, 36 x 24; two Babcock & Wilcox boilers; estimated horsepower, 675; hull built by Hammond Lumber Co., San Francisco, Cal.

Wooden steamer Solano, 205 ft. over all, for Hart-Wood Co., San Francisco, Cal.; triple-expansion engine, 13½, 22, 36 x 24; two Babcock & Wilcox boilers; estimated gross tonnage, 926; estimated horsepower, 700. Hull built by A. Peterson.

Wooden steamer Standard No. 1, 95 ft. over all, for Standard Oil Co., San Francisco, Cal.; estimated gross tonnage, 200; compound engine, 14 and 32 by 24; one Scotch marine boiler; estimated horsepower, 430. Hull built by F. Stowe.

Southern Pacific Co., W. Oakland Yards, West Oakland, Cal.

Double end car transfer steamer Contra Costa, 433 ft. 4 in. over all, for Southern Pacific Co., San Francisco, Cal.; approximate value, $400,000; estimated gross tonnage, 3,600; four simple inclined engines and eight Scotch dryback boilers; estimated horsepower, 2,000.

Double end passenger ferry steamers Alameda and Santa Clara, duplicates, 292 ft. 4 in. over all, for Southern Pacific Co., San Francisco, Cal.; approximate value, $450,000 each; estimated gross tonnage, 2,200 each; four tandem compound horizontal engines; four Babcock & Wilcox water tube boilers; estimated horsepower, 2,500.

Spedden Ship Building Co., Baltimore, Md.

Steam steel screw fireboat Cataract, 100 ft. over all, for Baltimore fire department; approximate value, $75,000; estimated gross tonnage, 120; fore and aft double high pressure engine and four watertube boilers; estimated horsepower, 560.

St. Tammany Ship Yard, New Orleans, La.

Twenty-in. non-propelling hydraulic dredge Pontchartrain, 18 ft. over all, for Jahncke Navigation Co., New Orleans, La.; approximate value, $125,000. Compound condensing engine and two Heine boilers, supplied by Elliott Machine Corporation, Baltimore, Md.

J. F. Duthie & Co., Seattle, Wash.

Steel sidewheel ferry Leschi, 169 ft. over all, for Port Commission of Seattle; approximate value, $85,000; estimated gross tonnage, 477; twin screw high pressure inclined engines with feathering paddle wheels; one Ballin watertube boiler; estimated horsepower, 700.

Thames Towboat Co., New London, Conn.

Wooden lighter, 90 ft. long, 35 ft. beam.

F. S. Bowker & Son, Phippsburg, Me.

Three-masted schooner William M. Critchett, wood, for Rogers & Webb, Boston, Mass.; length over all, 158 ft.; approximate value, $35,000; estimated gross tonnage, 544.

Dubuque Boat & Boiler Works, Dubuque, Ia.

Two self-propelled sternwheel suction dredges, H. S. Taber and Robert McGregor, duplicates, for U. S. Engineer Corps, Little Rock, Ark.; length over all, 197 ft.; approximate value, $150,000; estimated gross tonnage, 500; high pressure engine and Lyons boiler; estimated horsepower, 500.

Eight steel barges, duplicates, 100 ft. x 24 ft. x 5 ft., for U. S. Engineer Corps of Kansas City, Mo.

J. N. Rafuse, Conquerall Banks, N. S.

Schooner, 125 ft. over all, for Capt. Howard Corkum, J. N. Rafuse and others; approximate value, $18,500; estimated gross tonnage, 280.

Fishing schooner, 105 ft. over all, for Dauson & Fraleck and J. N. Rafuse; approximate value, $7,500; estimated gross tonnage, 100.

Wm. E. Woodall & Co., Baltimore, Md.

Two-masted ocean-going barge, 240 ft. over all, for P. Dougherty Co., Baltimore, Md.; approximate value, $50,000; gross tonnage, about 1,190.

Essington Ship Yard & Marine Railway, Essington, Pa.

Auxiliary sail yacht Fareeda, wood, 75 ft. over all, for Alex. Von Rennsalaer, Philadelphia, Pa.; approximate value, $30,000; estimated gross tonnage, 40; single, four-cylinder gasoline engine; estimated horsepower, 75.

Wood gasoline yacht, 60 ft. over all, for F. B. Bowers, Philadelphia, Pa.; approximate value, $10,000; estimated gross tonnage, 30; single, four-cylinder gasoline engine; estimated horsepower, 50.

Wooden barge (houseboat), 85 ft. over all; approximate value, $10,000.

Gildersleeve Ship Building Co., Gildersleeve, Conn.

Barge Elmer, 93 ft. over all, for Charles Gildersleeve, 1 Broadway, New York; approximate value, $5,500; estimated gross tonnage, 268; coal boat, no power.

Four barges, deck scows, duplicates, for Charles Gildersleeve, 1 Broadway, New York; 110 ft. over all; approximate value, $7,500 each; estimated gross tonnage, 309; no power.

Cobb, Butler & Co., Rockland, Me.

Wooden tug Charles P. Greenough, 144 ft. over all, for Commercial Tow Boat Co., Commercial wharf, Boston; approximate value, $30,000; estimated gross tonnage, 307.

Wooden fisherman East Hampton, 176 ft. over all, for Sickler & Meadows, 165 Broadway, New York; approximate value, $35,000; estimated gross tonnage, 407.

The Kelley-Spear Co., Bath, Me.

Three-masted wooden barge for the Commercial Towboat Co., Boston, Mass.; length over all, 240 ft.; approximate value, $65,000; estimated gross tonnage, 1,206.

Perth Amboy Dry Dock Co., Perth Amboy, N. J.

Wooden car float, 250 ft. over all, for Pennsylvania Railroad Co.

Four deck scows, wood, 100 ft. over all, for Sayre & Fisher Co.

Covered scow barge, wood, 90 ft. over all, for Robert Rogers.

Tank barge, wood, 120 ft. over all, for Barber Asphalt Paving Co.

Two covered barges, wood, 100 ft. over all, for Pennsylvania Railroad Co.

Two covered refrigerator barges, wood, 90 ft. over all, for Pennsylvania Railroad Co.

Six covered barges, wood, 90 ft. over all, for Pennsylvania Railroad Co.

Ten covered lighters, wood, 90 ft. over all, for Lehigh Valley Railroad Co.

Five covered refrigerator barges, wood, 90 ft. over all, for Lehigh Valley Railroad Co.

C. Hiltebrant Dry Dock Co., South Rondout, N. Y.

Wooden barge Katherine Howard, 120 ft. over all, for Thomas J. Howard, 1 Broadway, New York.

Wooden barge Riverside, 113 ft. over all, for Anthony O'Boyle, 1 Broadway, New York.

Wooden brick scow Rockaway, 116 ft. over all, for Washburn Bros. Co., Glasco, N. Y.

Wooden coal boat Francis O'Boyle, 90 ft. over all, for Anthony O'Boyle, 1 Broadway, New York.

Wooden canal boat, 112 ft. over all, for Anthony O'Boyle, 1 Broadway, New York.

Wooden coal barge, 115 ft. over all, for Owen McCaffrey's Sons, 1 Broadway, New York.

Wooden coal barge, 112 ft. over all,

for J. H. Blanchard, 1 Broadway, New York.

Derrick lighter, wood, 90 ft. over all, for the market.

Bath Iron Works, Bath, Me.

Steel steamer Katahdin, 115 ft. over all, for Coburn Steamboat Co., Moosehead Lake, Me.; approximate value, $28,000; 275 horsepower. Compound engine and one vertical tube boiler built by Portland Co., Portland, Me.

Ferryboat Bridgeton, duplicate of the Salem, above mentioned.

One three-track steel car float, 325 ft. over all.

One three-track steel car float, 270 ft. over all.

Double ended steel screw ferry boat, 170 ft. over all; double compound engine, two high and two low pressure cylinders; two straight through type boilers; estimated horsepower, 800.

Also 17 Scotch and two straight through type boilers for outside parties.

James Rees & Sons Co., Pittsburgh, Pa.

Stern wheel, steel hull, 165 ft. over all, for the Palma Navigation Co. of South America; approximate value, $50,000; gross tonnage, 300; high pressure engine.

Stern wheel steel tow boat, 175 ft. over all, for the Vesta Towboat Co.; approximate value, $85,000; gross tonnage, 150; tandem compound engine.

Racine-Truscott Shell Lake Boat Co., Muskegon, Mich.

Two steel light vessels Nos. 96 and 98, duplicates, 101 ft. over all; approximate value, $75,000; estimated gross tonnage, 250; bureau of lighthouses.

Survey cruisers Paquippe, Monomoy and Seajaquada, 82 ft. over all, approximate value, $30,000; estimated gross tonnage, 60; United States engineers.

Lake Launchings During 1913

Though Not an Especially Active Year Lake Ship Yards Nevertheless Put Overboard Thirty-Two Vessels of Various Kinds

DURING 1913, exclusive of Canadian yards, lake shipyards launched 32 vessels of which four were bulk freighters, five were oil tankers for the coast, two were passenger steamers, five were dredges and the remainder a variety of floating property. Of the four bulk freighters, two were of Canadian canal dimensions and the other two of 10,000 and 12,000 tons each, making the combined carrying capacity on a single trip 28,000 tons, or 560,000 tons in an average season of 20 trips.

During 1912, exclusive of Canadian yards, lake shipyards launched five bulk freighters having a carrying capacity of 48,000 tons on a single trip, or 960,000 tons in an average season.

During 1911, exclusive of Canadian yards, lake ship yards launched 42 vessels, of which nine were bulk freighters (four for coast service), two package freighters for coast service, two passenger steamers, two oil steamers, five oil barges, eight tugs, one fuel lighter, one sand steamer, one car ferry, three tow boats, four scows, two light vessels, one river lighter and one car float.

The five lake bulk freighters have a carrying capacity of 55,000 gross tons of ore in a single trip, or 1,100,000 tons in an average season of 20 trips.

During 1910, exclusive of Canadian yards, lake ship yards launched 51 vessels, of which 20 were bulk freighters, three package freighters, two passenger steamers, three car ferries, one river ferry, one lumber steamer, 12 tugs, three lighters, one lighthouse tender, one sand sucker, two dump scows and two gold dredges. Of this program the American Ship Building Co. launched 24, of which 10 were bulk freighters, one passenger boat, six tugs, three package freighters, two car ferries, one river ferry and one lighter. The Great Lakes Engineering Works launched nine bulk freighters; the Toledo Ship Building Co. one lumber steamer; the Manitowoc Dry Dock Co. two lighters, one sand sucker and two dump scows; the Racine Boat Mfg. Co., one lighthouse tender; Johnston Bros., five fish tugs and two gold dredges; and Robert Curr, at Cleveland, built and launched a tug from Murphy & Donnelly's boiler shop.

The 20 bulk freighters have a carrying capacity of 194,500 gross tons in a single trip, or 3,890,000 gross tons in an average season of 20 trips.

During 1909, the lake ship yards, exclusive of Canadian yards, launched 39 vessels, of which 17 were bulk freighters, five were package freighters, five passenger steamers, six tugs, five lighters and one survey boat.

During 1908, exclusive of Canadian yards, lake ship yards launched 39 vessels, of which 24 were bulk freighters, two passenger boats, one package freighter, three tugs, three fire boats, one lightship, two drill boats, one sand sucker and one supply boat.

These 24 bulk freighters have a carrying capacity of 101,400 tons on a single trip, or 2,028,000 tons in an average season.

During 1907 the lake ship yards exclusive of Canadian yards, launched 56 vessels, of which 40 were bulk freighters, three package freighters, one passenger steamer, one wrecker, one lighter, one mail boat, five tugs and four scows. These 40 bulk freighters have a carrying capacity of 368,000 gross tons on a single trip. However, as one of the new steamers, the Cyprus, sank on her second trip, the net addition of that year was 361,000, or 7,220,000 tons in an average season.

During 1906, the ship builders of the great lakes, exclusive of the Canadian yards, launched 47 vessels, of which 40 were bulk freighters, two passenger steamers, two package freighters, two car ferries and one sand dredge. The 40 bulk freighters have a carrying capacity of 381,000 tons on a single trip, or 7,620,000 gross tons in an average season of 20 trips.

During 1905, the ship builders of the great lakes launched 32 steamers, of which 29 were bulk freighters, two package freighters and one car ferry. These 29 bulk freighters have 260,200 gross tons carrying capacity on a single trip, or 5,204,000 gross tons in an average season of 20 trips.

During 1904 lake shipyards launched 13 vessels, of which seven were bulk freighters, two package freighters, one car ferry and three passenger steamers. The seven bulk freighters have a carrying capacity of 51,300 tons on a single trip, or 1,026,000 in an average season of 20 trips.

During 1903, lake shipyards launched 50 vessels, of which 42 were bulk freighters, five car ferries and three passenger steamers. These 42 bulk freighters have a carrying capacity of 213,250 tons on a single trip, or 4,265,000 tons in an average season of 20 trips. It should be stated, however, that 10 of the freighters were built

by Mr. Wolvin for St. Lawrence river trade and are actively engaged in that service, but as they are available for the ore trade, they have been classed as bulk freighters with an average capacity of 3,000 tons each on 18-ft. draught.

During 1902, the lake ship yards launched 41 vessels, of which 32 were bulk freighters (two of them barges), two passenger steamers, three package freighters, two car ferries and two vessels for salt water service. These 32 bulk freighters have a carrying capacity of 171,910 tons on a single trip, or 3,438,200 tons in an average season of 20 trips. The particulars of vessels launched during 1912 will be found in the table published on this page.

New Dredge for Rangoon

Wm. Simons & Co., of Renfrew, launched Nov. 28, with machinery on board, a Simons drag suction hopper dredger for Rangoon, built to the order of the Rangoon port commissioners. This vessel is fitted with a suction and discharge pump capable of raising and discharging 2,000 tons of material per hour.

Triple expansion surface condensing engines are fitted for driving the propellers or pumping outfit, as may be required. Steam is supplied from two cylindrical multitubular boilers constructed for a working pressure of 160 lbs. per sq. in. The main centrifugal pump is connected to a suction frame fitted in a central well at stern, and powerful water jets are arranged on the nozzle at the bottom of suction frame.

The hopper doors are controlled by powerful hydraulic gear, the power being supplied from one duplex set of steam pressure pumps. The hopper arrangements include Simons patent suction apparatus which enable the load in the hopper to be discharged overboard for reclamation purposes, as well as through folding doors in the bottom by the ordinary method.

Simons patent sand trapping apparatus are also provided in the hopper. These arrangements have been proved to be very effective in retaining the light material which would otherwise be lost in the overflow from the hopper.

TABLE OF LAKE LAUNCHINGS DURING 1913

Where built.	Type.	Name of Vessel.	Length over-all, ft.	Carrying capacity, gal.	Name and Address of Owner.
AMERICAN SHIP BUILDING CO.					
Cleveland	Oil Barge	No. 84	260	1,000,000	Standard Oil Co., New York.
Lorain	Oil Barge	No. 85	260	1,000,000	Standard Oil Co., New York.
				Gross tons.	
Wyandotte	Bulk Frtr.	A. D. MacTier	257	3,000	Geo. Hall Coal Co., Ogdensburg, N. Y.
Wyandotte	Bulk Frtr.	F. P. Jones	257	3,000	Geo. Hall Coal Co., Ogdensburg, N. Y.
Lorain	Bulk Frtr.	R. E. Trimble	600	12,000	Pittsburgh Steamship Co., Cleveland.
Superior	Repair ship	Robt. J. Close	125	......	The Tomlinson Co., Duluth, Minn.
Port Arthur	Ice tug	J. T. Horne	125	......	Great Lakes Dredging Co., Port William, Ont.
Lorain	Bulk Frtr.	A. C. Dustin	545	10,000	Cleveland Steamship Co., John Mitchell, mgr., Cleveland.
Lorain	Oil Str.	Comet	260	800,000	Standard Oil Co., New York.
Cleveland	Oil Str.	Radiant	260	800,000	Standard Oil Co., New York.
Lorain	Oil Str.	Brilliant	260	800,000	Standard Oil Co., New York.
Port Arthur	Pass. Str.	Noronic	385	....	Northern Navigation Co., Ltd., Collingwood, Ont.
Chicago	Lighter	———	150	....	By-Products Coke Co., Chicago, Ill.
Detroit	Drill Boat	———	140	....	C. H. Starke Dredge & Dock Co., Milwaukee, Wis.
Port Arthur	Paddle-wheel Str.	———	227	....	Canadian Pacific Railway.
Port Arthur	Tug	———	98	....	Canadian Pacific Railway.
GREAT LAKES ENGINEERING WORKS, DETROIT, MICH.					
Ecorse	Pass. Str.	North American	282	....	Chicago, Duluth & Georgian Bay Transit Co., Chicago.
Ashtabula	Sand Str.	Chas. Heiden	160	....	C. H. Little Co., Detroit, Mich.
Ecorse	Car Ferry	———	350	....	———
Lake Borgne	4 coal barges	———	240	1,000 ea.	Alabama & New Orleans Transp. Co., New Orleans, La.
Ecorse	Dredge	Multnomah	193.6	....	Portland Iron Works, Portland, Ore.
Ecorse	Dredge	Wahkiakum	193.6	....	Portland Iron Works, Portland, Ore.
Ashtabula	Grain Ltr.	T. & C. No. 2	114	670	Thornton & Chester Milling Co., Buffalo, N. Y.
Ashtabula	Flat Scow	Hibernian	125	....	Dunbar & Sullivan Dredging Co., Buffalo, N. Y.
MANITOWOC SHIP BUILDING & DRY DOCK CO., MANITOWOC, WIS.					
Manitowoc	Dipper Dredge	"No. 6"	110	....	Fitzsimmons & Connell Dredging Co., Chicago, Ill.
Manitowoc	Suction Dredge	Hydro	181	....	Hydraulic Sand & Transit Co., Chicago.
Manitowoc	Hydraulic Dredge	Niagara	140	....	Duluth Superior Dredging Co., Duluth.
Manitowoc	Car Float	"1913"	190	....	Erie Land & Improvement Co., Chicago, Ill.
Manitowoc	Car Float	"1914"	190	....	Erie Land & Improvement Co., Chicago, Ill.
Manitowoc	Harbor tug	Frederick U. Robbins	87	....	Erie Land & Improvement Co., Chicago, Ill.
TOLEDO SHIP BUILDING CO., TOLEDO, O.					
Toledo	Ferry	Essex	105	....	Detroit & Walkerville Ferry Co., Walkerville, Ont.
COLLINGWOOD SHIP BUILDING CO., LTD., COLLINGWOOD, ONT.					
Collingwood	Bulk Frtr.	James Carruthers	550	11,300	St. Lawrence & Chicago Steam Nav. Co., Ltd., Toronto.
Collingwood	Self-prop. buc. drgr.	Dredger No. 14	223	....	Canadian government.
Collingwood	Self-prop. buc. drgr.	Dredger No. 15	223	....	Canadian government.
Collingwood	Pass. & Pkg. Frtr.	———	146	....	Pelee & Lake Erie Nav. Co., Ltd., Pelee island, Ont.
POLSON IRON WORKS, TORONTO, ONT.					
Toronto	Suction Dredger	Port Nelson	180	....	Canadian government.
Toronto	Sternwheel Tug	———	117	....	Canadian government.
Toronto	Car Float	———	224	....	Canadian Pacific Railway.
COWLES SHIP YARD CO., BUFFALO, N. Y.					
Buffalo	Tug	Colonel Ward	61	....	Benjamin L. Cowles, Buffalo, N. Y.
Buffalo	Supply Boat	Handy Boy	45	....	John Provencher, Buffalo, N. Y.

Wrecks on Pacific Coast

The Year Has Not Been a Good One for the Underwriters—Some Important Losses

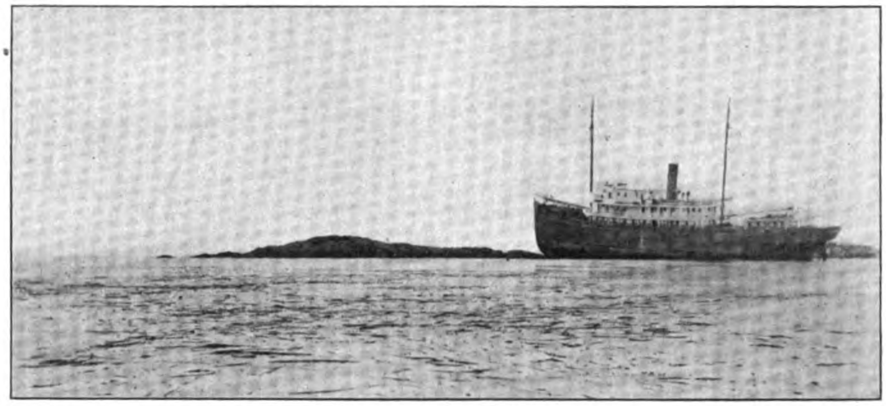
SEATTLE, Dec. 24.—No pangs of regret will be experienced by underwriters interested in Pacific coast shipping when 1913 goes into history. The expiring year has surely been a period of ill luck and misfortune for floating property on this coast as evidenced by the fact that there have been thirty-one total losses, many of them entailing the payment of thousands of dollars. Sailing ships have suffered severely and the year has removed nearly a score of American schooners and barks, engaged in the lumber trade. As no more of these vessels are being built, the American offshore sailing fleet is rapidly diminishing and at the rate of loss during 1913 it will be only a short time before this once large fleet disappears entirely.

Of the many mishaps and the many narrow escapes, that of the State of California is the most pathetic, as it resulted in the loss of 32 lives. Carrying many excursionists, this vessel was making the usual ports of Southeastern Alaska when she struck an uncharted rock in Gambier bay, Aug. 17. The fine vessel sank so quickly that many of those aboard had no chance to escape and went down with the vessel. This accident was absolutely unavoidable, as the presence of the submerged rock was unknown and Capt. T. H. Cann, of this vessel, was exonerated and with his men given high praise for their splendid conduct in the face of danger and death.

The case of the German ship Mimi, which cost six lives, records one of the most peculiar marine accidents in Pacific coast history. The Mimi went ashore in February on the Oregon coast, while bound in ballast to the Columbia river. By skillful effort she was floated several weeks later. Some of the ballast was removed and in a heavy gale, just after she was taken off the beach, the big square rigger turned turtle and six men aboard went down with her. The vessel became a total loss.

The mishap to the British ship Glenesslin, which in October was lost but a short distance from the scene of the Mimi's accident, gave a glaring illustration of negligence and indifference. The vessel went on the rocks in broad daylight and in clear weather, while the captain remained asleep and the mate was too busy to heed the second officer's warning. These officers were disciplined.

Among the American sailing ships lost during the year were the barkentine Amaranth, schooners Americana, Aloha, Borealis, Balboa, Eldorado, J. D. Spreckles, J. H. Lunsmann, Lyman D. Foster, Robert Searles, bark S. C. Allen and schooner Transit. With the exception of the Spreckles and Transit all these vessels were engaged in the lumber and coal carrying trades between this coast, Australia and South America. Most of them were disabled in heavy weather and abandoned.



STEAMER YUKON, ASHORE ON SANNAK ISLAND, ALEUTIAN PENINSULA. SHE WAS A TOTAL LOSS

The cases of the Amaranth, Americana and Eldorado furnish material for the romance writer, for no more peculiar mysteries of the sea have been recorded in years. The fate of the Amaranth and the Eldorado has been explained, but it is possible that the story of the Americana may forever remain unknown.

The Americana and Eldorado sailed from the Columbia on March 3 and April 1, respectively, laden with lumber, the Americana for Sydney and the Eldorado for Antofagasta. Months elapsed and no word was received of either vessel. Both were finally given up for lost until on Nov. 5, Capt. Benson and three members of the Eldorado's crew arrived at Papeete after sailing 2,000 miles in an open boat. Then only was their tale known. On June 13, the schooner, disabled in a terrific South Pacific gale, waterlogged and crippled, was abandoned. The crew sailed more than 1,000 miles in their boat, finally reaching Easter Island, where they were received by the natives. After remaining on this island four months the captain and three sailors determined to make for civilization, and at last reached Papeete, where they took passage on a steamer for San Francisco. The other members of the crew decided to cast their lot with the natives.

To this day it is not known what happened to the Americana, although several months ago it was supposed that her remains had been found on Jarvis Island, in the South Pacific. Later developments proved it to be the wreck of the Amaranth, whose crew were saved. The similarity in the names led to the erroneous report, but it did not clear the mystery surrounding the disappearance of the Americana. It is supposed the vessel foundered with all hands in the same storm which wrecked the schooner Lyman D. Foster, in April.

Alaskan and British Columbian waters claimed their share of shipping property this year. The steamers State of California, Yukon, and Curacao were total and heavy losses in the north. The Curacao was a needlessly heavy loss, for the investigation showed that good seamanship might have saved the vessel and most of the cargo. The Curacao and State of California were victims of uncharted rocks, while the Yukon's loss was due to fog. In British Columbia waters the steamers Weiding Brothers and Jeanie were lost. The

former went ashore in fog and heavy weather on the outside of Vancouver Island, while the Jeanie was wrecked last week in Queen Charlotte Sound, going aground in fog and becoming a total loss with her valuable cargo before assistance could reach the scene.

Among the mishaps which hit the underwriters heavily were the loss of the coastwise lumber carrier Riverside and the mishaps to the British steamer Robert Dollar, the Norwegian steamer Thode Fagelund and German bark Thielbek. Careless navigation put the Riverside ashore on the California coast, while carrying about 1,500,000 ft. of lumber. The vessel and cargo were a total loss. The Riverside was a fine steel vessel of the type especially adapted for lumber carrying. She was built at Seattle at a cost of $200,000, and was well insured. The Robert Dollar cost $60,000 to repair after being picked up at sea with rudder gone and stern post cracked. The Thode Fagelund and Thielbek were in collision in the Columbia river and it required $40,000 to repair the extensive damage done to each.

The year witnessed the usual number of strandings, loss of deck cargo in heavy weather, collisions and other mishaps. Altogether it was a bad twelve month for the marine insurance companies, and they will bid it farewell with no trace of regret.

Following is a summary of the important marine mishaps on the Pacific during 1913:

PACIFIC COAST CASUALTIES DURING 1913.

AMARANTH, Am. Bktn., bound from Newcastle, N. S. W., to San Francisco, with coal, wrecked on Jarvis Island, Aug. 30; crew saved; vessel and cargo total loss.

AMERICANA, Am. schr., from Columbia river March 3, with lumber for Sydney, missing; supposed to have foundered in South Pacific with all hands.

ALOHA, Am. schr., waterlogged and abandoned at Destruction Island, off Washington coast, bound from Navua to Grays Harbor; later taken in tow but broke loose and disappeared; supposed to have gone ashore on Vancouver Island; total loss.

BOREALIS, Am. schr., with lumber from Mukiltoe for Samoa, wrecked Feb. 10 on Tonga Island; vessel and cargo abandoned and sold for £580.

BALBOA, Am. schr., bound from Callao to Grays Harbor, wrecked off Grays Harbor spit, Dec. 1; total loss; crew saved.

BENDER BROTHERS, Am. power schr., burned and practically a total loss in Seattle Harbor, Dec. 1.

CORDOVA, Am. ss., ashore for 48 hours in Wrangell Narrows, Alaska, Jan. 17; some damage; again ashore at Karheen, Alaska, April 23; considerable damage.

CHARLES NELSON, Am. steam schr., laden with 750,000 ft. of lumber, burned at Field's Landing, Cal., April 24; vessel and cargo total loss.

CURACAO, Am. ss., aground on Fish Egg Island, Alaska, May 1; little damage; wrecked June 21 at Warm Chuck, Prince of Wales Island, Alaska, and with valuable cargo a total loss.

CLAVERLEY, Br. ss., bound from Portland, Ore., to United Kingdom, with cargo of wheat, ashore near Punta Arenas, Oct. 31; part of cargo salved; vessel floated and later beached for survey; heavy damage.

CORONADO, Br. barge, laden with coal, foundered in Gulf of Georgia, B. C., bound from Vancouver Island to Vancouver; vessel and cargo total loss.

DOLPHIN, Am. ss., ashore in Alert Bay, B. C., June 30; considerable damage.

ELVIRA, Am. whaling schr., wrecked in Arctic ocean.

ELDORADO, Am. schr., bound from Columbia river for Antofagasta, disabled in gale and abandoned in latitude 30 south, June 13; crew saved and landed at Easter Island; captain and three of crew landed at Papeete Nov. 5.

FULTON, Am. ss., seriously damaged ashore in British Columbia waters, in April.

GLENESSLIN, Br. sh., wrecked at Neahkahnie Mountain, Oregon, Oct. 1, while bound from Montevideo to Columbia river; total loss; crew saved.

H. J. CORCORAN and SEMINOLE, Am. ss., in collision in San Francisco harbor, Feb. 14; both vessels practically total loss; valuable cargo salved.

HERAKLES, Nor. ss., ashore in Fraser river, B. C., July 16; later floated but required extensive repairs.

IKALIS, Br. ss., aground at Mororan, May 8; lost part cargo and was later floated; costly repairs required.

J. D. SPRECKLES, Am. fishing schr., rammed by STATESMAN, Br. ss., off San Francisco, March 27; schr. total loss with cargo of codfish.

JEANIE, Am. ss., aground in Bellingham Harbor, July 14; some damage; wrecked at Clark Point, Calvert Island, B. C., Dec. 19, and with valuable cargo is total loss; vessel valued at $35,000, and insured for $26,000.

LATOUCHE, Am. ss., struck submerged rock in Icy Straits, Alaska; some damage.

J. H. LUNSMAN, Am. schr., rammed and sunk in San Francisco harbor by FRANCIS H. LEGGETT, Am. ss., July 12; schooner's cargo and vessel total loss.

LYMAN D. FOSTER, Am. schr., bound from Bellingham for Levuka, with 900,000 ft. of lumber, abandoned April 30 off Suva; towed into Suva and abandoned; cargo sold for £4,244.

LADY ELIZABETH, Nor. bk., bound from British Columbia for Cape Town, with lumber, put into Port Stanley, disabled in heavy weather; heavy damages.

LORD DERBY, Br. ss., struck rock in Rosario straits, Puget sound, April 4, and damaged to extent of $60,000.

MACKINAW, Am. ss., struck breakwater at San Pedro, April; badly damaged.

MIMI, Ger. ship, aground off Nehalem, Ore., bound from West Coast for Columbia river; while salvors were working aboard after floating vessel she turned turtle and became total loss; six lives lost; went ashore Feb. 13.

MINNESOTA, Am. ss., fire in sulphur cargo in March; returned to Seattle Oct. 1 with machinery out of order; ashore in Inland sea, Japan, in November, but floated and proceeded undamaged.

MARY SACHS, Am. schr., of Stafansson expedition, reported lost in Arctic.

MERCED, Am. ss., total loss at Point Gorda, Cal., Oct. 16.

NECANICUM, Am. ss., in collision with BEAVER, Am. ss., off California coast, Oct. 31; both seriously damaged.

OPHIR, Br. ss., total loss by fire in Fraser river, B. C., May 9; six lives lost.

OSCAR, Br. ss., fire and explosion aboard, at Nanaimo, B. C.; total loss.

POLERIC, Br. ss., arrived at Seattle Jan. 23, after having serious bunker fires.

POINT ARENA, Am. ss., total loss at Pigeon Point, Cal., Aug. 11; vessel insured for $20,000.

PLEIADES, Am. ss., and THOMAS L. WAND, Am. ss., in collision off San Francisco, Nov. 9; both damaged.

RIVERSIDE, Am. ss., with 1,500,000 ft. of lumber, total loss aground at Blunt's Reef, Cal.; vessel valued at $200,000; abandoned to underwriters

ROBERT SEARLES, Am. schr., with lumber from Columbia river for Astoria, arrived at Kahului, Oct. 4, totally disabled; lost part of deckload; abandoned to underwriters and sold.

ROBERT DOLLAR, Br. ss., with lumber from Columbia river for Shanghai, struck Columbia river bar March 13, lost rudder; towed into Puget sound disabled; repairs cost $60,000.

SEWARD, Am. ss., from San Francisco for Balboa with general cargo, lost rudder off Cape San Lucas; went into Mazatlan and towed back; costly job for underwriters.

STATE OF CALIFORNIA, Am. ss., struck uncharted rock in Gambier bay, Alaska, Aug. 17; total loss with part cargo; 32 lives lost; insured for $175,000.

SAMOA, Am. ss., total wreck off Point Reyes, Cal., Jan. 28.

S. C. ALLEN, Am. bk., with lumber from Port Ludlow for Honolulu, went ashore at Diamond Head, Hawaii, Oct. 13; abandoned to underwriters and sold for $4,000.

STANLEY DOLLAR, Am. ss., partly laden with lumber, ashore on Viti rocks, Puget sound, Oct. 24; cargo lightered; extensive repairs required.

THODE FAGELUND, Nor. ss., in collision with THIELBEK, Ger. sh., at Astoria, Aug. 24; both vessels badly damaged requiring repairs costing about $40,000.

TRANSIT, Am. schr., wrecked at Point Barrow, Arctic ocean, in September.

TEMPLE E. DORR, Am. ss., and YELLOWSTONE, Am. ss., in collision off Point Arena, March 29; both damaged.

WEIDING BROTHERS, Am. fishing ss., wrecked on Frederick Island, B. C., July 23; total loss.

WASHTENAW, Am. tank ss., and SIMLA, Br. tank barge, ashore off Point Gorda, Cal., Sept. 24; both damaged; repairs cost about $75,000.

WASP, Am. power schr., wrecked and total loss, Aug. 24, off Kuskokwim river.

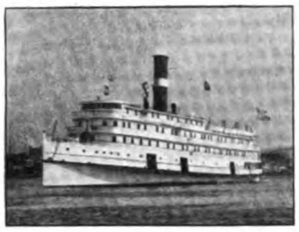
YUKON, Am. ss., aground near Unimak Pass, Alaska, and total loss, June 11.

Transport and Supply Ship

The navy department opened bids on Dec. 20 for the construction of a transport and supply ship. The transport is to be 460 ft. long, 61 ft. beam and 20 ft. draught, and the supply ship 400 ft. long, 55 ft. beam and 21 ft. draught. For the construction of the transport the following bids were received: New York Ship Building Co., $1,752,000; Fore River Ship Building Corporation, $1,804,000; Seattle Construction & Dry Dock Co., $1,931,000; Newport News Ship Building & Dry Dock Co., $1,730,000; William Cramp & Sons Ship & Engine Building Co., $1,832,000.

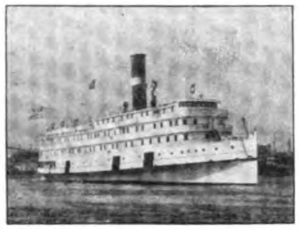
For the construction of the supply ship the bids were: New York Ship Building Co., $1,399,500; Fore River Ship Building Corporation, $1,419,000; Seattle Construction & Dry Dock Co., $1,404,000; William Cramp & Sons Ship & Engine Building Co., $1,401,000; Newport News Ship Building & Dry Dock Co., $1,350,000.

The Clooney Construction & Towing Co., Westlake, La., reports that it has about $75,000 in contracts now on hand, consisting mostly of work for small gasoline tug boats and barges ranging from 90 to 200 ft. long, all of which will probably be completed and delivered before the end of the year. The barges are for use principally in towing oil at Tampico, Mexico, and some few log barges. The tug boats range from 45 to 65 ft. in length, two being for the Texas State Quarantine Service, one for Mexico, one for Houston ship channel, and two for the Calcasieu river.



Two New Steamers

The City of Richmond and City of Annapolis of the Chesapeake Steamship Co.'s Fleet

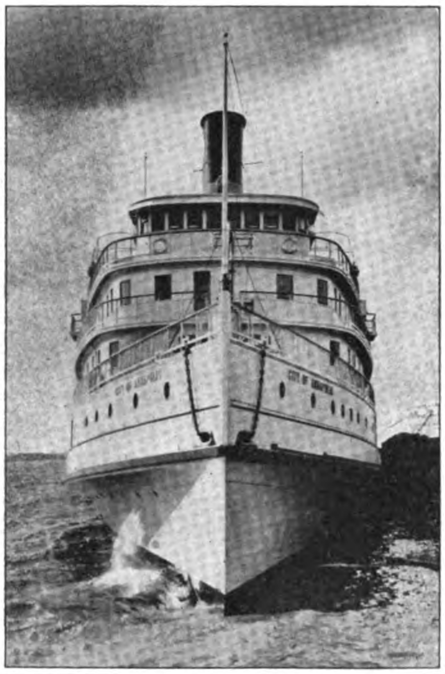


THESE vessels were recently completed by the Maryland Steel Co. for the Chesapeake Steamship Co. to run on their Baltimore and Richmond route. That the management of the Chesapeake Steamship Co. is alive to all the interests of its patrons is being demonstrated by the service it affords. These new steamers which they have just put in commission are the finest and most modern that run out of Baltimore; they combine all the comfort, convenience and luxury that the traveling public now demand and the manner in which the Maryland Steel Co., under the direction of Key Compton, president of the Chesapeake Steamship Co., have fitted up these vessels speaks for the same popularity with the traveling public that the Baltimore and Norfolk Line has enjoyed since those fine samples of marine luxury, the City of Baltimore and City of Norfolk, were put in service. The new vessels are named City of Richmond and City of Annapolis.

The general dimensions are as follows:

Length over all	277 ft. 0 in.
Length between perpendiculars	267 ft. 0 in.
Beam molded on water line	43 ft. 0 in.
Beam molded over guard	53 ft. 0 in.
Depth molded to main deck	16 ft. 5 in.
Draught loaded	12 ft. 6 in.

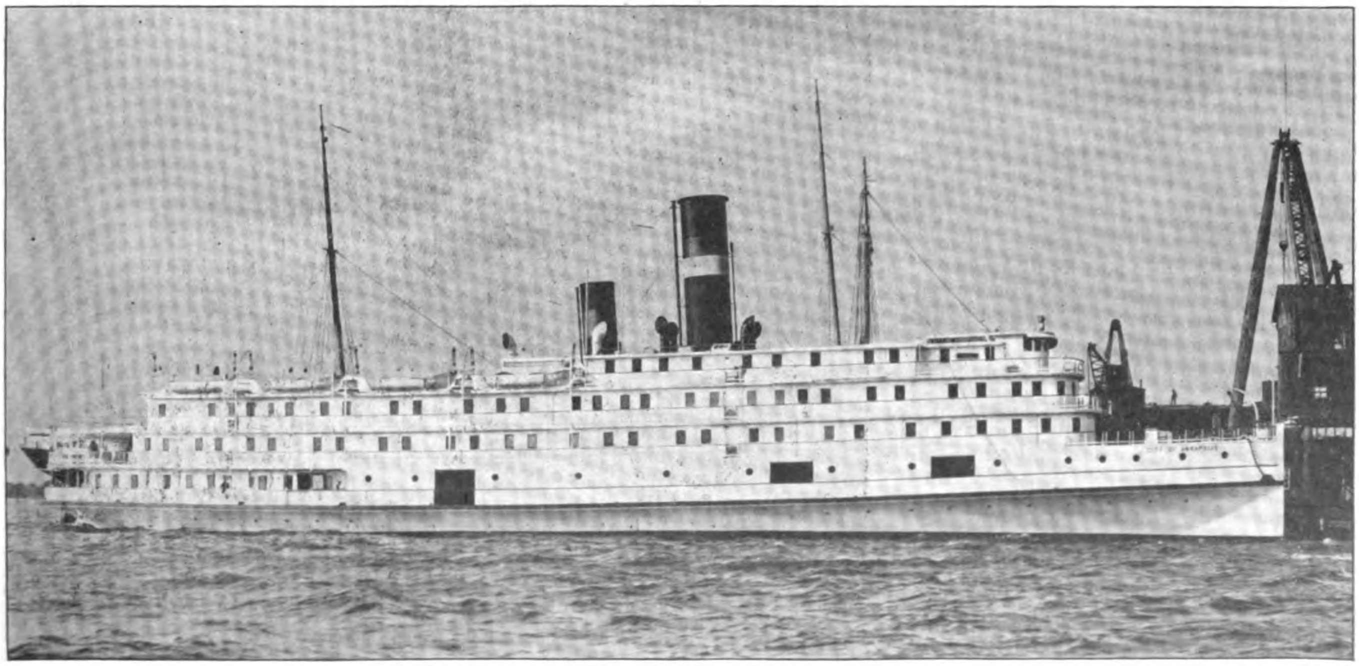
These vessels are built on the Isherwood system of longitudinal construction and are classed by Lloyds A-1 for 20 years for bay service.



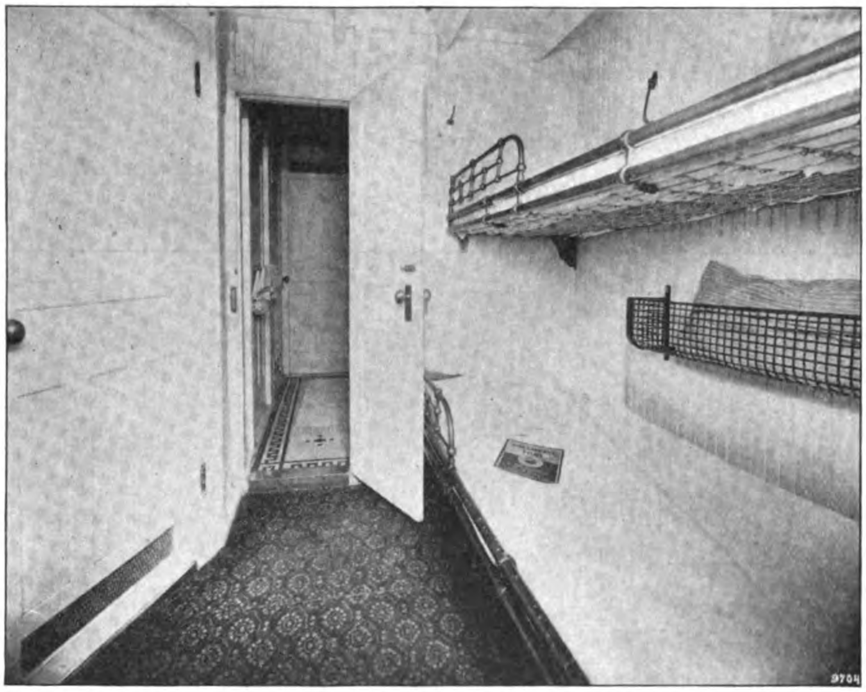
BOW VIEW CITY OF ANNAPOLIS

The hull is constructed of mild open-hearth steel, with flat plate keel, bilge keel, lower and main decks. Main deck is plated all fore and aft, with wood deck over. The stem, stern post and rudder are of best hammered scrap iron. There are seven bulkheads of which five are watertight.

The general finish is old ivory throughout the saloons, passengers' dining saloon, smoking room on gallery deck and lobby. Lobby on main deck aft is finished in selected mahogany, as are all main stairways. Ornamental metal balustrades are fitted on all stairways and around the wells. Ladies' saloon aft on main deck is finished in sycamore. The president's room is on gallery deck and is paneled in old ivory, and has brass bed, hard wood floor, wardrobe and private bath and toilet adjoining. The captain's quarters consist of office, bedroom and private bath and is finished in quartered oak. The other officers and the crew have quarters on hurricane deck aft of captain's suite and the finish throughout is cypress finished natural. The officers' and crew's mess room, pantry, bathroom and showers are also on this deck. A private stairway leads from this deck to main deck for use of crew and stewards. Over the well in after saloon is fitted a large skylight with ornamental ceiling and over main stairway aft is a large dome skylight



BROADSIDE VIEW OF THE STEAMER CITY OF ANNAPOLIS



A STATEROOM ON THE CITY OF ANNAPOLIS

fitted with sash with polychrome leaded glass. Opening off the smoking room on gallery deck is the wireless room, barber shop and a commodious bar. There is also a "Steiff" piano in lobby on this deck. The chief engineer and assistant engineers have large rooms on main deck aft of freight space and alongside smoking room.

There are four staterooms with two berths and showers, 90 staterooms having two metal berths, seven bedrooms with brass beds, five of which have showers, nine bedrooms with brass beds and private baths communicating, seven staterooms with two metal berths and private bath communicating, total of 117 staterooms. All staterooms are fitted with independent heat and running water. The outboard staterooms and bedrooms are fitted with inter-communicating telephones and the inside rooms with return call bells. Telephones are also fitted in president's room, purser's office, bar, wireless room, dining room, captain's room, chief engineer's room and engine room. The spaces on lower deck forward and aft are divided into quarters for first and second-class men and women; aft on main deck is ladies' cabin.

The pilot house is large and roomy and is finished in oak and has all necessary mechanical telegraphs and speaking tubes to engine room, also McNab and running light indicators.

The floors of dining saloon, lobby, smoking rooms, toilets and treads of all stairs are covered with interlocking rubber tiling. The saloons are carpeted and all staterooms except those with showers are carpeted. The bedrooms with showers are fitted with hard wood floors and rugs.

The vessels are fitted with steam windlass, steam steering engines and steam elevator engines. In addition to steam steering gear there is an auxiliary hand gear located on saloon deck aft.

The vessels are well lighted throughout by means of bracket fixtures and clusters on newel posts of all the principal stairways, current being derived from turbine-driven generators.

The baths and showers are fitted for both hot and cold fresh and salt water. Water heated by a steam heater in engine room.

The main engine is of the four-cylinder, triple-expansion, surface condensing type, having cylinders 23, 38 and two 45 in. diameter by 36-in. stroke. The cylinders are arranged with one low pressure at forward end and one low pressure at after end of engine, and are supported at front by round wrought steel columns and at back by cast iron "Y" columns. The back columns are fitted with cross-head guides of the hollow bar type. Connecting rods have brass boxes top and bottom with gib and key connections.

The Main Engine

The crank shaft is of the built-up type in two pieces. The bed plate is of cast iron having four short and two long main bearings, bearings consisting of two brass boxes held in place by wrought steel binders and steel bolts. The valve gear is of the "Stevenson Link" type with a steam ram reverse engine located at back of main engine. A one-cylinder steam turning engine is located on after side of after low pressure back column and operates through worm and gearing on crank shaft. A main air pump 22 in. diameter by 13-in. stroke and two bilge pumps, each 5 in. diameter by 13-in. stroke, are driven by levers and links from after low pressure crosshead.

As these boats operate on a night schedule it is essential that the engine be as nearly balanced as possible. This was done by a system of equalizing the moving weights. In regular service it was found that the engines

SMOKING ROOM, MAIN DECK, STEAMER CITY OF ANNAPOLIS

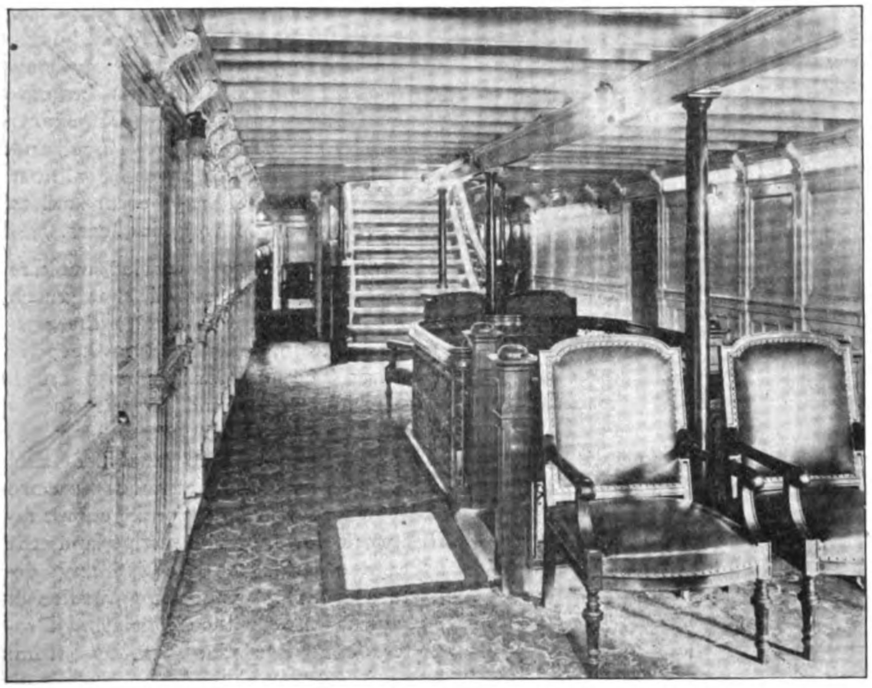
were remarkable quiet. The City of Richmond was also tried at the builders' dock with the wheel removed and the engine ran at its normal service R. P. M., at which speed ther were no perceptible vibrations. The propeller is of the built-up type having a cast iron hub and four manganese bronze blades and is 11 ft. 6 in. diameter by 16 ft. 3 in. pitch.

Steam is generated by four single end Scotch type boilers, each 12 ft. 10 in. diameter by 10 ft. 10 in. long and contain three 41-in. inside diameter corrugated furnaces. Boilers are built to meet the requirements of United States steamboat and Lloyds inspection rules for 190 lbs. working pressure; the total heating surface being 6,845 sq. ft. and the total grate surface being 225.5 sq. ft. A donkey boiler of the return tubular, dry back type, 7 ft. 3 in. diameter by 6 ft. long, built for 190 lbs. working pressure, is located on main deck in casing.

The main condenser is independent of the main engine framing and is located at back of engine; it contains 3,810 sq. ft. of cooling surface. The following auxiliaries are fitted:

A multi-coil feed water heater, two 25-K. W. turbine-driven electric sets, one 5-K. W. engine-driven electric set, two vertical simplex 10 in., 6 in. and 24-in. feed pumps, one horizontal duplex 6-in., 5¾-in., 6-in. condenser drain pump, one vertical duplex 12-in., 7-in., 12-in. fire and donkey pump, one horizontal duplex 6-in., 7½-in., 6-in. sanitary pump, one horizontal duplex 5¼-in., 4¾-in., 5-in. fresh water pump, one centrifugal circulating pump with 12-in. nozzles, driven by a vertical single cylinder 9 in. by 9 in. steam engine, one horizontal duplex 4½-in., 3¾-in., 4-in. Mate's pump located forward, two horizontal duplex 3-in., 2-in., 3-in. hot water pumps and an ash ejector in fire room.

The character of the piping is first class throughout, the main and auxiliary steam lines being of steel and all outboard piping of copper not less than ¼ in. thick.



SOCIAL HALL IN THE CITY OF ANNAPOLIS

National Rivers and Harbors Congress

The National Rivers and Harbors Congress, at its tenth annual meeting in Washington on Dec. 5, adopted the following resolutions:

The National Rivers and Harbors Congress, assembled in its tenth annual convention, hereby renews its declaration of the purposes, policies and scope of the activities for which it was organized and to which it has adhered throughout its existence. It has been and is the policy of this congress to promote the improvement and maintenance of our harbors and waterways for the purposes of transportation and commerce, without reference to any particular project. As our membership includes representation from all sections of our country, our endeavor is to induce congress, by adequate appropriations made annually, to provide for as speedy improvement of our waterways and harbors as may be practicable, having in view such an equitable distribution of the appropriations between the different portions of the country as may be just and in accordance with the demands of our commerce.

The activities of the congress are limited to the objects stated. While some of our waterways may be put to beneficial uses in addition to the paramount claims of navigation, and while it would be wise in such cases that the full benefits of such waterways should be attained, having constantly in view their subordination to navigation, the advocacy of measures looking to the use of our waterways for purposes other than those of navigation is beyond the scope of the purposes and policies of this congress.

The congress of the United States has our hearty approval of its adoption of, and adherence to the principle of annual river and harbor appropriations. We renew our approval of the legislation of congress in the Panama canal law, exempting from tolls vessels of the United States engaged in our coastwise trade and affording protection to water-borne commerce against railroad ownership or control, and we earnestly recommend an extension of that legislation to effectually prevent railroad domination of our harbors and waterways.

We again earnestly urge upon congress the adoption of a broad plan and policy of waterway improvement, and, for the purpose of carrying out that plan and policy, the making of annual appropriations for rivers and harbors to the extent of at least fifty millions of dollars.

We further urge upon congress legislation directed to securing the fullest benefit that can be derived from the improvement and maintenance of our waterways and harbors by legislation to insure the following results, which must be fully established before the commerce of our country can be adequately protected and made free and our people derive the full fruit of appropriations that may be made:

There should be legislation providing for the standardization of our waterways with respect to their capacity for navigation, both as to the depth, width and all other essentials of channels.

Transportation by rail and water must be so regulated that there will be free interchange of traffic and the equitable pro-rating of through rates, and this should be compelled, in interstate commerce, by congressional legislation.

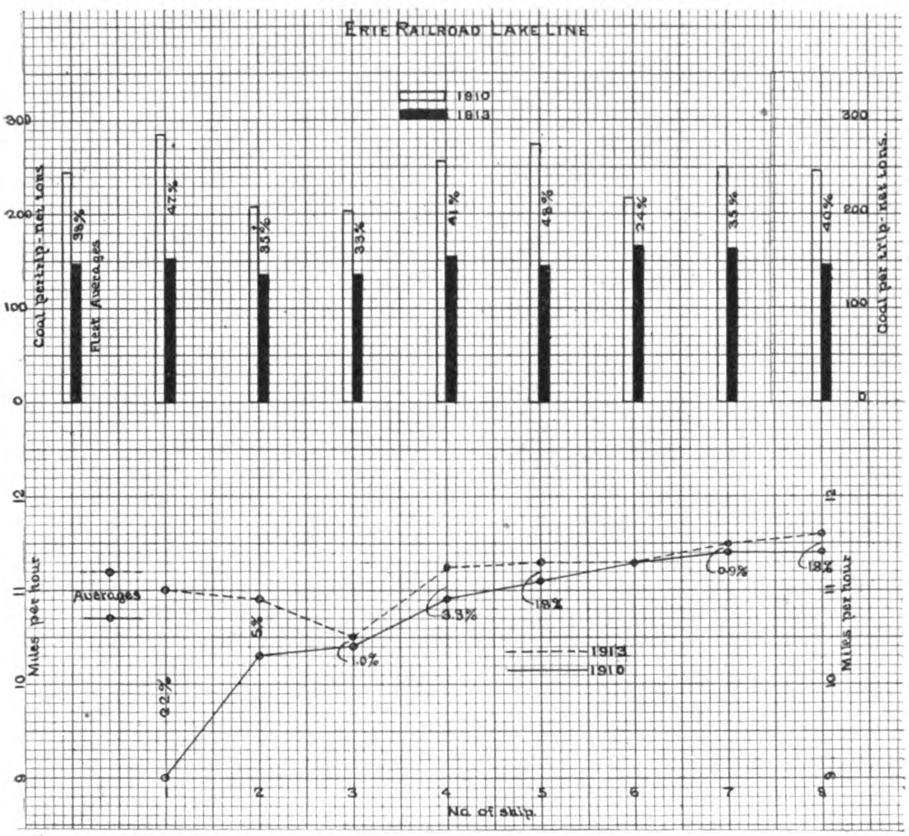
Domination and control in any form, directly or indirectly, by railroads over water transportation, or by those engaged in water transportation over railroads, should be prohibited by approprite legislative enactment, both national and state.

An Interesting Summary

Comparison of Work of Erie Railroad Lake Line Steamers

THE REVIEW presents herewith a summary of the comparative work of each ship of the Erie Railroad Lake Line and of the fleet as a whole based upon operation for the season of 1910 and for which acknowledgments are due to C. S. Goldsborough, manager, New York. For readiness of comparison the results have been plotted in graphic form both as to speeds and fuel.

In the diagram 1910 speeds are represented by the solid line and work of not only each ship but of the fleet



COMPARATIVE PERFORMANCE CHART, ERIE RAILROAD LAKE LINE

as a whole is apparent at a glance. It will be seen that the fleet average is 10.6 miles with high at 11.4 miles and low at 9.0 miles. It should be understood that the speed is derived from total mileage divided by total hours under way, and includes checks for fog, river work, etc. In the work of improvement a fleet average of 11 miles was aimed at.

The fleet average as now constituted is shown by the dotted line. It will be seen that while two ships still fall below the desired average the fleet average is well above and in fact higher than desirable either for best economy or for conditions of operation and 0.5 mile higher than 1910. No ship shows a falling off. Ships Nos. 2 and 3 cannot be brought up to the average economically but they are also the smallest of the fleet and do not, therefore, affect operation to the same extent as larger units. The increase in fleet average is 4.7 per cent with individual averages ranging from 0.9 to 22 per cent.

The fuel performance is also shown graphically. The height of the unshaded areas represents average trip fuel for 1910 and the shaded areas the trip fuel for 1913. Tonnage can be read directly from the diagram and also the reduction percentage. The diagrams are numbered to correspond with the speed diagram and the fleet average is also shown.

If the increase in fleet speed is taken into account the reduction percentage, which, as shown on diagram, is 38 per cent, would be about 45 per cent. The coal used in port would of course not be affected by speed changes.

In actual weights the reduction since the improvements were taken in hand amounts to over 28,000 tons.

Further reductions are expected as the speeds are harmonized and also from changes in methods of operation which experience has suggested but additional figures will probably not be given out.

Additional interesting information is found in the increase in trips per ship of 15.3 per cent for almost exactly the same period of operation. Cost of lubrication, although one of the smallest items of operating expense, was reduced from 9.05 cents per hour's run to 3.6 cents without in any way altering methods or reduction in efficiency. The coal figures are exact; the total charged to the ships and the total car weights agreeing almost exactly so that if any error exists it is necessarily in weighing cars.

Details of the work carried out are withheld but it is stated that much of the improvement is due to the system of notation employed in keeping records. The log form carries much information not found in the forms usually employed and each log as turned in is at once analyzed and transferred to a continuous record sheet which shows at once comparative work for individual trips and the average of trips to date and any departure from previous best results is examined into without delay. Propeller constants for various trims have been established by numerous observations and serve as checks not only on mileage but on engine revolutions and speeds. About two hours covers the work entailed but since the entire season's work of each ship is complete with the analysis of the last log all that remains is to collect the footings and extensions to arrive at the collective performance. The effect is to keep the plant and personnel at high efficiency and to indicate at once in what direction to look for any falling off.

While the results attained are not looked upon as finality they form an interesting conclusion to a remarkable series of engineering data, the more so because of the unusual liberality of the Erie line in giving out information of a nature usually difficult to obtain.

An Excellent Meeting

The Twenty-first Annual Meeting of the Society of Naval Architects and Marine Engineers is Quite Spirited

THE twenty-first annual meeting of the Society of Naval Architects and Marine Engineers was held in the society's rooms, Engineering Societies' building, 29 West Thirty-ninth street, New York, on Dec. 11 and 12. The meeting was postponed from November to December to afford lake members a better opportunity of attending, but unfortunately very few of them showed up, though the lake membership was considerably increased through the efforts of Harvey D. Goulder. In the absence of President Robert M. Thompson, Vice President Walter M. McFarland presided.

VICE PRESIDENT WALTER M. McFARLAND

The annual report of Secretary and Treasurer Cox showed assets of $23,-661.55, and liabilities of $215.50. The membership increased during the year from 731 to 770, though the deaths were 15 and the resignations 13.

The death list was read as follows, while the members stood: Sir William Henry White, Charles H. Cramp, George W. Quintard, Edwin S. Alexander, Thomas F. Carter, Edwin S. Cramp, William H. Fletcher, Robert Forsyth, Frank D. Hall, Valdemar F. Lassoe, Walter Aucker, Albert K. Butler, Henry F. Donaldson, Anson Phelps Stokes and Aaron Vanderbilt.

E. A. Stevens and F. E. Kirby were elected honorary vice presidents in place of Charles H. Cramp and G. W. Quintard, deceased. J. W. Miller, R. M. Watt, A. P. Niblock and W. M. McFarland were elected vice presidents for the term expiring Dec. 31. 1916. W. I. Babcock and W. F. Durand were elected vice presidents to fill vacancies caused by the promotion of E. A. Stevens and F. E. Kirby.

J. H. Linnard was elected member of council to fill the vacancy caused by the promotion of W. I. Babcock. The executive committee for the ensuing year is as follows: W. L. Capps, Lewis Nixon, W. I. Babcock, Stevenson Taylor and David W. Taylor.

The members of council for the term expiring Dec. 31, 1916, are as follows: W. I. Babcock, W. L. R. Emmet, A. L. Hopkins, C. W. Jungen, C. A. McAllister and H. P. Norton.

The associate members of council for the term expiring Dec. 31, 1916, are, R. A. C. Smith and J. R. Andrews.

Daniel H. Cox was re-elected secretary and treasurer.

The address of Vice President McFarland was as follows:

"Gentlemen, at the last meeting of the society, a portion of the president's address was devoted to a notice of the death of some of our distinguished members. That sad duty arises again this year, as we have lost two of our honorary vice presidents, Charles H. Cramp and George W. Quintard, and our oldest honorary member, Sir William H. White, K.C.B.

"In their day of activity, Messrs. Cramp and Quintard were leaders in our profession, both being at the head of establishments famous in marine work. I count it a privilege to have known both of these distinguished men and to have been honored with their friendship, and I am glad to have the honor of bearing testimony to their ability and to their splendid work for American shipbuilding. They were among the founders and incorporators of our society, and were vice presidents from the beginning. They showed their interest by becoming life members and thereby helping to give the society a solid financial basis.

"As Mr. Quintard's funeral occurred in New York, the society was represented among the honorary pallbearers, and a great many members were present at the services. In the case of Mr. Cramp and of Sir William White, this was not possible, and resolutions of condolence were sent to their families.

"Sir William White has been an honorary member of the society since

November, 1904. He was one of the world's greatest naval architects, and no man was more revered by his brethren on this side of the ocean.

"The report of the secretary and treasurer at the last meeting showed a total membership of 733 and during the meeting at that time 63 new members were added, so that at the close of our 1912 meeting we had a membership of 796. During the past year the society has suffered somewhat by deaths and resignations, but it is believed that these losses will be more than offset by new membership to be acquired during our meeting.

Gratifying Growth

"It is also a noteworthy fact that a great improvement is shown in the payment of back dues and that it was not necessary to drop any members after the meeting last year for failure to pay their dues. All those in substantial arrearage either paid up or showed an inclination to make partial payments.

"The financial condition of the society demonstrates careful management of our limited resources. We find that our secretary and treasurer has been able, after paying all current bills, to forward $500 to the committee in charge of the Panama-Pacific Engineering Congress, to invest in a certificate of deposit for $1,000, and that a substantial balance remains on deposit.

"It will be noticed that the society is holding its annual meeting nearly a month later than usual. This change was decided upon by the council in order to accommodate the active and energetic membership, which comes from the Great Lakes, and who, owing to conditions existing about the middle of November, have never heretofore been able to attend our meeting in the numbers desired. We must say that our lake friends have made a strong and persistent effort to arouse interest in this change, and as a consequence, we have a large number of new members.

"As a consequence of the terrible Titanic disaster, an International Conference has been held in London of the world's foremost naval architects, in order to bring about a world-wide effort to minimize, as far as mortal man is able, the dangers of vessels at sea.

"I am proud to say that the membership of this society has taken a distinguished part in that conference, the delegates being Admiral Capps, Commissioner Chamberlain, General George Uhler, H. L. Ferguson, A. G. Smith and Prof. H. C. Sadler.

"Furthermore, the proceedings of this society have been drawn upon for consideration of this question and a large number of papers were dispatched some time ago to the board of trade for use in its consideration of the subject.

"It was decided at the last meeting that this society should participate in the International Congress, to be held at the time of the Panama-Pacific Exposition in 1915, and I wish to commend this matter to your attention. You have been sent circulars in regard to this matter and as this congress will be a notable one you would do well to take part.

"You have also received circulars in regard to the memorial to be erected to Sir William White, in London. It is certain that no man ranked higher than he in the profession of naval architecture and marine engineering. One of his most valued awards of merit was his honorary membership in this society, and I am sure that those of you who were so fortunate as to meet him, never met a more perfect gentleman. We could in no more fitting way show our great admiration for Sir William White and our sincere regret at his death than by making a substantial response to the invitation of the British Society to join in securing an appropriate memorial to his memory.

"Turning now to some matters of technical interest during the past year, we may note that, as might have been anticipated, the loss of the Titanic has had a considerable effect. The sister ship Olympic was withdrawn from service for a number of months while an inner skin was fitted. It was, I think, the general opinion that if the Titanic had had such a double hull, she would not have been lost.

Lifeboat Equipment

"The circumstances attending the Titanic disaster (where, owing to the ice fields, the water was quite smooth, and probably all of the people on board could have been saved if there had been enough boats), led to a general demand that seagoing ships should be fitted with ample provision of life boats for everybody on board. This, in its turn, has caused marked attention to be given to improved forms of cranes, to insure the rapid and safe lowering of the boats.

"This audience, well posted on such matters, needs only to be reminded that the circumstances of the Titanic's loss were very unusual, and that the calm sea, which prevailed on that occasion, could not ordinarily be expected. In consequence, designers and seafaring men generally have been of the opinion that it is more important to make the ship herself as nearly as possible reliable and unsinkable, rather than to place dependence on the boats. This view of the problem had a striking confirmation recently in the loss of the steamer Volturno by fire. It will be remembered that through the beneficent agency of wireless telegraphy the doomed vessel was, in a comparatively short time, surrounded by a fleet of other vessels, all anxious to render assistance; but the sea was so rough that it was practically impossible for boats, even manned by expert seamen, to do any effective work. The opportune arrival of an oil tank steamer, and the subsequent reduction of the force of the sea by the application of oil, enabled the boats to be employed.

"We note, also, that in cargo vessels, improved methods of construction intended to give maximum strength and capacity with minimum of material are being employed.

The Diesel Engine

"With respect to machinery, it may be remarked that the increased use of the Diesel engine has not been so rapid as its enthusiastic admirers anticipated. It was, of course, obvious to all naval architects and marine engineers that the general use of the Diesel engine depends on the ability to construct single cylinders of large power. Although we still hear of experiments with cylinders of 1,000 and 2,000 H. P., and even rumors of vessels that are to have engines with such cylinders, I think I am correct in saying that up to date the largest cylinders which have been used in successful installations are of about 250 H. P. As a consequence of this, an equipment of several thousand horsepower means a multiplicity of cylinders, with all the numerous parts requiring care and attention.

"In this progress age, it would be exceedingly unwise to say that any problem in mechanics (which does not absolutely defy natural law) is impossible, but all who have studied the problem of the Diesel engine will realize that the construction of cylinders for large powers is an exceedingly difficult one. If a metal could be discovered with all the good qualities of cast iron and about four or five times its thermal conductivity, the problem would be much simplified.

"There is another aspect of the Diesel engine which is not often referred to; namely, that not all kinds of fuel oil are adapted to its use. This is not surprising, when it is remembered that some of the oils have a large percentage of silt and other impurities, and it would hardly need to be mentioned but for the fact that, in the early days, it was claimed that any kind of fuel, including powdered coal, was entirely suitable.

"The most serious commercial drawback to the Diesel engine has been

the recent increased price of oil. When crude oil could be obtained for 2 cents a gallon, or thereabouts, there was no question of the fuel economy as measured in dollars. Speaking roughly, the Diesel engine has about double the efficiency of the steam engine; and also, speaking roughly, when burned under a steam boiler, average coal and average oil are of the same thermal value, as measured in money, when the price of the coal per ton in dollars is twice the price of the oil per gallon in cents; or, in other words, 2-cent oil is equal to $4 coal. It thus appears that when the relative engine efficiencies are taken into account, the Diesel engine with 2-cent oil would be equal to the steam engine and boiler with coal at $2 a ton. When the price of oil is doubled, however. this advantage is lost; and, from the figures given, it is easy to see that, speaking roughly, when the price of oil is above 4 cents a gallon, a good steam engine and boiler will produce power at a less money cost for fuel per unit than the Diesel engine.

"I may remind you that our vice president, Admiral Cone, while engineer-in-chief of the navy, arranged for the building of a Diesel engine for one of the navy fuel ships, and this work is now under way at the New York navy yard. When this engine is finished, the navy department will undoubtedly conduct extended experiments which will give a great deal of valuable information.

"The limitation as to the quality of oil mentioned above does not seem to hold where it is a question of using oil as fuel under steam boilers. Well designed burners give good results even with Mexican oil and all its impurities.

Advantage of Oil Fuel

"The many advantages of oil fuel, where its price is not prohibitive, commend it very highly, and its use on steam vessels is steadily increasing.

"For naval vessels, water tube boilers have, for many years, been used exclusively. In the merchant marine their introduction is not as rapid as their merits would seem to warrant, although they are being used more and more widely for service in all parts of the world. My study of this subject has led me to attribute the rather gradual adoption of these boilers in the merchant service to conservatism, the existing plants for the manufacture of cylindrical boilers, and their cost. My personal relations to this subject suggest that I should not, in an address of this kind, go into the matter more fully, although I have felt that the subject ought to be mentioned.

"As in the case of the water tube boiler, so in that of steam turbines, their use has now become practically exclusive in naval vessels. It has been realized almost from the first that the faster the vessel, the better the opportunity for the turbine, and the recent very high-speed destroyers have shown this conclusively. For slower vessels, there are now three methods of adapting the turbine so as to secure high steam economy in the turbine and also high-propeller efficiency, all of which are essentially forms of reduction gear, although the details are quite different.

Reduction Gear

"The simplest form is undoubtedly the mechanical reduction gear, which was first proposed by Admiral Melville, and has been developed in this country by George Westinghouse. In a form differing as to some details, it has been very successfully applied in England by Sir Charles Parsons. The figures, as I last heard them, were that more than 380,000 H. P. of geared turbines has been installed there. Two vessels have 30,000 H. P. each. As a matter of sentiment, I am sure you will all be pleased to know that on the naval repair ship Melville, named after our late associate, Admiral Melville, his gearing is to be used.

"A second form of reduction gear is the electric drive, on which a paper describing its installation on the U. S. naval collier Jupiter, is to be read at this meeting. A cargo boat for the Great Lakes, designed by one of our members, where Diesel engines are the motive power, also utilizes the electric drive. I believe a third example of this system is now under construction in England.

"The last method is the hydraulic reduction gear, of which one example is now under construction in Germany.

"For motor boats, nothing has thus far been found to surpass the gasoline engine. The enormous use of automobiles and motor boats of all kinds has given an unequalled opportunity for the perfection of this form of engine. From the thermal viewpoint, I imagine little improvement is to be expected, but from time to time certain mechanical improvements are made, some of which are of very great value.

"Much has been written about the possibility of the straight gas engine, operating in connection with a gas producer. So far as I know, only a few installations of this kind have been made, and those only on a small scale. From what I know of gas engine practice on land, it would seem to me that this problem for large powers would have many of the same difficulties as obtain in the case of the Diesel engine. Here, too, it would be absurd to say that large engines of this type may not be produced that will give great satisfaction, but the outlook at present does not seem promising.

"It must always be a source of keen chagrin to the occupant of this chair, as it is to me, to be unable to tell you that there is a big increase in the number of vessels in our ship yards for the foreign trade. A few vessels are now under construction for trading to the west coast of South America, but with this exception our yards are doing absolutely nothing along this line. I have urged in the past that our society should take active steps to secure action from congress looking to some encouragement of our shipbuilders in this regard, but thus far we have done nothing.

"It looked at one time as though a scheme, championed by one of our prominent members, was going to receive a trial by virtue of the provision of the new tariff law, which allows a reduction of duty on goods imported in American ships. It appears, however, that the diplomats of other countries were more clever than our own in the drafting of commercial treaties, and that our hands are tied unless our government denounces nearly all such treaties. This is, of course, a very serious matter, and one requiring careful thought before action is taken. It does seem, however, as though statesmanship could not find a better field than action which would build up a great industry and give employment to a large number of our citizens.

Important Food Stuffs

"I have just learned from one of our members who has given this subject very careful study that the foregoing statement is rather too inclusive. It appears that the status of the treaty question is such that the law can be enforced to a limited extent, as not all countries have treaties to prevent it. The benefit which would come from even this partial application of the law would be very helpful to the creation of an American-built commercial fleet in the foreign trade.

"Years ago, when our principal exports were the product of the farm and the plantation, and when, indeed, the proportion exported was equal to, or greater than, that consumed at home, there might have been ground for the old theory that each country should confine itself to what it could produce cheapest; but circumstances have changed and we are now facing the question of possibly importing food stuffs ourselves.

"It now costs more to build and operate vessels flying the American

flag than those of other countries, for well-known reasons, among them the high scale of all American wages. But it certainly does not follow that this will always be true. If we had never assisted promising industries because their unaided product would cost more than it could be bought for abroad, we should not now lead the world, as we do, in the manufacture of steel and other products. We believe that, with reasonable encouragement from the government, a large fleet in the foreign trade will be built up, carrying our own flag, and that the general benefit to the country will be so great as to make the aid seem entirely insignificant. We believe that enlightened statesmanship might profitably be employed in this great constructive work, and we feel, therefore, that we are not demanding anything unreasonable when we ask that American shipping should receive the fostering care of the government."

Annual Dinner at Waldorf

The society then proceeded with the reading and discussion of the papers, of which a full report is carried in this issue. The sessions were brought to a close with the annual dinner at the Waldorf-Astoria, the speakers being: Franklin D. Roosevelt, assistant secretary of the navy; President Humphreys, of the Stevens Institute; Hon. W. B. Ellison and Lewis Nixon. A loving cup was presented to Stevenson Taylor, Com. J. W. Miller making the presentation speech.

Those in attendance at the dinner were:

G. A. Anthony, G. D. Ali, J. R. Andrews, A. Allen, H. L. Aldrich, J. J. Amory, C. G. Amory, Benjamin Andrews, D. Almy, C. F. H. Almy, E. H. B. Anderson;

W. T. Berry, L. M. Brigham, Harry Brown, H. H. Brown, E. A. Burnside, J. L. Bertie, Joseph Bough, G. E. Burd, F. T. Bowles, William Binley Jr., G. K. Bradfield, A. H. Ball, Geo. E. Best, Joseph Barre, D. Bailey, W. I. Babcock, F. W. Baker;

Gardiner Cornett, A. Collins, W. G. Coxe, W. F. Carnes, James Craig, Irwin Chase, T. M. Cornbrooks, C. A. Christoffers, W. E. Coykendall, J. H. Chalker, C. A. Carr, D. H. Cox, F. E. Carpender, J. M. Cherry;

M. M. Drake, G. B. Drake, L. B. Darling, W. D. Dickie, Captain Dickens, F. B. Dalzell, H. C. Davis, W. J. DuBois, J. E. DuBois, G. C. Davison, H. W. Dixon, H. S. Demarest, F. L. DuBosque, Warren Delano, Commodore de Aquino, M. W. Day, Mr. Davis, James Donald;

H. L. Ebsen, H. A. Everett, J. M. Emery, Hon. W. B. Ellison;

Andrew Fletcher, D. E. Ford, P. S. Fales, M. Fraser, T. E. Ferris, H. N. Fletcher, James French, F. L. Fernald;

F. W. Graham, John Garney;

F. D. Herbert, A. D. Hunt, A. S. Hebble, J. S. Heck, R. Hutchinson, D. Howard, G. J. Hermiston, C. Sherman Hoyt, John Hudson, W. R. Haynie, W. D. Hoxie, W. N. Howell, O. Z. Howard, Capt. Harris, N. W. Howard, A. L. Hopkins, M. F. Hay, Dr. Humphreys, O. L. Halenbeck, Robt. Haig, R. S. Haight, C. E. Hyde;

D. J. Irish, J. W. Isherwood;

Capt. Jarker, H. Jobson, A. E. Jordan, Eads Johnson, R. C. Jones, Howard Jones, H. Johannsen, Chas. Jackson;

James Kennedy, Ch. John Kenlon, L. Katzenstein, J. Katzenstein, M. L. Katzenstein, G. Katter, J. W. Kellog, W. D. Kearfoot, T. C. Kearfoot;

George Lawley, S. I. Leslie, J. S. Leslie, W. J. A. London, J. H. Linnard, C. S. Linch, G. E. Lawrence, J. Luttman, R. H. Lavene;

A. J. McGarvey, Spencer Miller, Edmund Mills, J. L. Montgomerie, Robt. McGregor, D. Mathieson, Robt. Monteagle, David Miller, F. A. Martin, J. A. Moran, E. P. Morse Sr., E. P. Morse Jr., Mr. Murray, F. F. Morse, John Moore, J. H. B. McKenzie, B. Mills, J. H. Mancor, H. A. Munn, C. A. McAllister, H. A. Magoun, W. M. McFarland, J. W. Miller, A. M. Main, Mr. Morrell;

Thomas Niven, Samuel Newton, W. C. Nickum, Wm. Nish, J. A. Nash, Alfred Noble, H. B. Noaks, W. M. Newman, Lewis Nixon;

E. H. Peabody, N. F. Palmer, Capt. W. B. Porter, N. B. Payne, W. W. Pelkington, H. L. Potter, W. J. Parslow, James Plummer, H. L. Payne, C. H. Peabody, A. C. Pessano, J. P. Palen, J. W. Powell;

J. A. O'Neil, J. E. Otterson;

Ludwig Ruprecht, Capt. Reising, G. J. Robinson, Wm. Robinson, S. R. Richards, C. E. Ross, R. R. Row, W. H. Raab, T. F. Rowland Jr., C. B. Rowland, W. H. Rutland, Mr. Robinson, Assistant Secretary Roosevelt, W. S. Rogers, E. M. Reiss, E. P. Robinson;

John Sharpe, Linden Stuart, E. A. Stevens Jr., R. J. Snyder, Mr. Schmidt, C. Skentleberry, Capt. Sampson, Geo. Slate, E. B. Sadtler, George Simpson, W. D. Stultz, W. A. F. Smith, H. R. Sutphen, John Shields, J. R. Smith, George Surand, C. R. Stewart, G. C. Shepard, F. N. Stacy, N. L. Snow, F. B. Slocum, H. S. Snyder, S. Sternberg, F. B. Smith, H. C. Sadler, Capt. H. B. Seeley, Robt. Stocker, S. K. Smith, J. D. Stout, Wm. Shaw, E. A. Sperry;

Stevenson Taylor, G. P. Taylor, S. P. Taylor, W. H. Todd, J. H. Todd, J. K. Turnbull, R. de Tankerville, M. Turnbull, W. B. Tardy, D. H. Thomson, J. G. Tawresey, Bruno Tornroth, Wm. Thayer;

W. F. Volz;

T. R. Williams, J. F. Whitaker, Jas. Walsh, C. N. Wales, Admiral Watt, G. E. Weed, H. N. Whittelsey, W. E. Waterhouse, Mr. Witherspoon, W. E. Williams, W. A. White, W. T. Webster, W. A. White (guest), W. F. Worthington, Capt. Wolfert, D. T. Worden, J. G. Winship.

The following were admitted to membership during the sessions:

Members

R. E. Anderson, assistant to general manager, Lake Torpedo Boat Co., Bridgeport, Conn.

George Allen Anthony, marine engineer, war department, Washington, D. C.

Luigi Barberis, naval constructor, Italian navy, Ministero Marina, Roma, Italy.

Harry W. Broady, chief engineer, Welin Marine Equipment Co., 305 Vernon avenue, Long Island City.

Geheimer Oberaurat Buerkner, chief constructor, German navy, Reichs Marine Amt, Berlin.

Myron Blodgett, 312 Lyceum building, Duluth, Minn., superintendent of repairs for O. W. Blodgett.

Norman A. Currier, steamboat inspector, Halifax, Nova Scotia.

John W. Graham, superintendent engineer, A. H. Bull S. S. Co., 1570 Seventy-third street, Brooklyn, N. Y.

Nelson W. Howard, superintendent, Geo. Hall Coal Co., Ogdensburg, N. Y.

David J. Irish, mechanical engineer, Babcock & Wilcox Co., Bayonne, N. J.

Thomas W. Jackman, engineer, Mutual Transit Co., P. O. Box 987, Buffalo, N. Y.

Arthur H. Jansson, engineering department, the Welin Marine Equipment Co., 305 Vernon avenue, Long Island City.

Frederick W. Jones, chief engineer, mechanical department, N. Y., N. H. & H. R. R. Co., Harlem River Station, N. Y.

Robert MacNab, assistant naval constructor, marine and fisheries department, Ottawa, Canada.

Anderson MacPhee, marine engineer, Schutte & Koerting Co., Philadelphia, Pa.

John E. Otterson, assistant naval constructor, U. S. N., navy yard, Boston, Mass.

Richard Pemberton, government overseer, department of marine and fisheries, Ottawa, Canada.

Edward A. Plunkett, agent, Jas. Shewan & Sons, Foot Twenty-seventh street, Brooklyn.

Arthur Morris, naval architect, Elswick ship yard, Newcastle-upon-Tyne, England.

John Shields, president, Atlantic Basin Iron Works, 27 Imlay street, Brooklyn, N. Y.

John Sharp, chief engineer, Polson Iron Works, Toronto, Canada.

Edwin B. Sadtler, agent in N. Y., N. Y. Shipbuilding Co., 50 Church street, New York.

Augustus Suzara, chief engineer, Bureau Navigation, Manila, P. I.

Karl H. Schaffrau, chief engineer, Royal Prussian Experimental Tank, Berlin, N. W. Kirchstrasse 25.

Wassily W. Wassillieff, foreman, Sveaborgsky, Port Helsingfors, Russia.

J. Murray Watts, naval architect, 326 Chestnut street, Philadelphia.

Frederick A. Willsher, chief draftsman, Geo. T. Davis & Sons, Levis, Quebec, Canada.

Henry T. Wright, naval constructor, U. S. N., navy yard, Norfolk, Va.

James H. Chalker, captain, United States revenue cutter service, Custom House, New York.

Frederic R. Harris, civil engineer, navy yard, New York.

James Montgomerie, surveyor Lloyds Register, 17 Battery Place, New York.

Associates

George D. Ali, manager, foreign shipping department, Standard Oil Co., 26 Broadway, New York.

William H. Becker, treasurer, Pollock-Becker Co., P. O. Box 987, Cleveland, Ohio.

Alva Bradley, secretary and treasurer, Alva Steamship Co., 706 Marion building, Cleveland, Ohio.

Omer W. Blodgett, vessel owner, 312 Lyceum building, Duluth, Minn.

Harry S. Bradley, assistant general manager, Wheeling Mold & Foundry Co., Wheeling, West Va.

Harvey H. Brown, 1624 Rockefeller building, Cleveland, Ohio.

Richard B. Cook, draftsman, Cox & Stevens, 15 William street, N. Y.

Thomas C. Burke, attorney at law, 1035 Marine National Bank building, Buffalo, N. Y.

Harry Coulby, president, Pittsburgh Steamship Co., Rockefeller building, Cleveland, Ohio.

Harry S. Demarest, sales manager, Greene, Tweed & Co., 109 Duane street, New York.

Edwin T. Douglass, general manager, the Western Transit Co., 47 Main street, Buffalo, N. Y.

Edward H. Ellison, chief engineer, Art Metal Construction Co., Jamestown, N. Y.

Charles W. Elphicke, vessel owner, Western Union building, Chicago, Ill.

Otto L. Halenbeck, assistant manager, lighterage department, Standard Oil Co., 26 Broadway, New York.

William A. Hawgood, marine engineer, Perry-Payne building, Cleveland, Ohio.

W. R. Haynie, U. S. representative, Charles Freres, Ghent, 30 Church street.

Charles M. Heald, president, Mutual Transit Co., 1318 Chamber of Commerce, Buffalo, N. Y.

Lawrence L. Henderson, general manager, Montreal Transportation Co., Montreal, Canada.

Sherwin A. Hill, attorney at law, 904 Union Trust building, Detroit, Mich.

Carl C. Joys, president, Vance & Joys Co., 211 Mitchell building, Milwaukee, Wis.

James H. B. MacKenzie, consulting engineer, 24 Stone street, New York.

S. Victor McLeod, superintendent, Algoma Central S. S. Co., Sault Ste. Marie, Ont.

Frederick A. Meyer, secretary, Smith, Davis & Co., Buffalo, N. Y.

James S. Morton, president, the Gretham & Morton Transportation Co., Benton Harbor, Mich.

Claude J. Peck, manager, the Shenango Steamship Co., Cleveland, Ohio.

Fritz K. Ruprecht, draftsman, Robins Dry Dock Co., 1 South Oxford street, Brooklyn, N. Y.

John R. Russel, vice president and treasurer, Great Lakes Engineering Works, Detroit, Mich.

Howard L. Shaw, general manager, The Lake Transit Co., Bay City, Mich.

Edward Smith, president, Buffalo Dry Dock Co., 1116 New Marine Bank building, Buffalo, N. Y.

Frances N. Stacy, statistician, Lake Superior & Mississippi Canal Commission, Holland House, New York City.

J. J. Sullivan, bank president, Cleveland, Ohio.

Horace S. Wilkinson, president, Toledo Shipbuilding Co., Toledo, Ohio.

Andrew W. Carmichael, assistant naval constructor, navy yard, Norfolk, Va.

William L. Rodgers, captain, naval war college, R. I.

Juniors

Caryl H. Roundry, draftsman, hull division, navy yard, Norfolk.

Angel C. Hedalgo, lieutenant, Ecuadorean navy, P. O. Box 36, Philadelphia.

Associate to Member

Walter A. Clarke, Fore River Shipbuilding Co., Quincy, Mass.

A. W. Frank, assistant navigation constructor, navy yard, New York.

Junior to Member

Gordon G. Holbrook, estimator, engineering department, Bath Iron Works, Bath, Me.

F. A. Cook, Atlantic, Gulf & Pacific Co., New York City.

Pearl Harbor Dry Dock

Washington, Jan. 5.—Request has been made by the navy department of the Attorney General to advise it whether the contractors for the dry dock at Pearl Harbor, Hawaii, are bound to complete the structure at the original contract price, notwithstanding that the dock bids fair to be a total loss on account of an upheaval of the bottom. It is expected that it will be decided that the contractors will have to go ahead with the work intended originally to cost more than $3,000,000.

The dock was designed to be 1,000 ft. long, so constructed that it could be divided into sections for the docking of smaller vessels without flooding the entire structure. While the dock itself was to cost about $3,400,000, the abandonment of shop buildings, a power plant, and other costly auxiliaries, would likewise be involved, so that the total loss would be much greater.

Besides the dry dock, a large amount of work has been done toward the establishment of a naval base and repair plant at Pearl Harbor. Six shop buildings, a central power plant, a large general storehouse, and an administration building are practically completed. Work is in progress on six sets of naval officers' quarters, and a contract recently was signed for two additional sets of quarters. Marine barracks and three buildings for marine officers' quarters are practically finished. Plans have been prepared and are ready for advertisement for a gymnasium and storehouse on the marine corps reservation. On Kuahua Island there are under construction by contract five magazines, shell houses, etc., and a reinforced concrete wharf is being built by yard labor. Six additional magazine buildings will be erected on the island. Work also is in progress on a coaling station that ultimately will have a capacity of 200,000 tons of coal, with facilities for rapidly discharging and loading colliers and barges. Fuel-oil storage tanks, with an aggregate capacity of about 33,000 tons, are being installed by contract.

The ship building returns for the year on the Tyne show the highest output on record of 100 vessels of 441,826 tons launched, as compared with 93 vessels of 397,791 tons in 1912. The highest production is that of Messrs. Swan, Hunter & Wigham Richardson, Ltd., Wallsend, who launched 22 vessels of 107,636 tons. Messrs. Armstrong, Whitworth & Co.'s return is nine vessels of 99,333 tons, which is a record for the Elswick firm.

Some Model Experiments

Relative Resistance of Some Models With Block Co-efficient Constant and Other Co-efficient Varied

THE first paper read was Naval Constructor D. W. Taylor's paper on "Relative Resistance of Some Models with Block Coefficient Constant and Other Coefficients Varied", of which the abstract is as follows:

This paper gives the results of an investigation into the question of the most suitable midship section coefficient from the point of view of resistance for combinations with a given block coefficient.

Twenty models were tried having block coefficients ranging from 0.56 to 0.68 and midship section coefficients ranging from 0.86 to 1.08. These models weighed 2,500 pounds each in fresh water.

Full information is given as to the details of shape of the models, their wetted surfaces, etc.

All models were tried in deep water and also in water only 20 inches deep, a false bottom being fitted in the model basin. Results are given in the form of effective horsepower curves in deep water for 20 500-ft. ships upon the lines of the model and similar curves for 20 300-ft. ships in water 25 ft. deep. Finally a diagram is given showing the relative residuary resistances of the models in deep and shallow water. The most important conclusions indicated by the experiments are as follows:

Important Conclusions

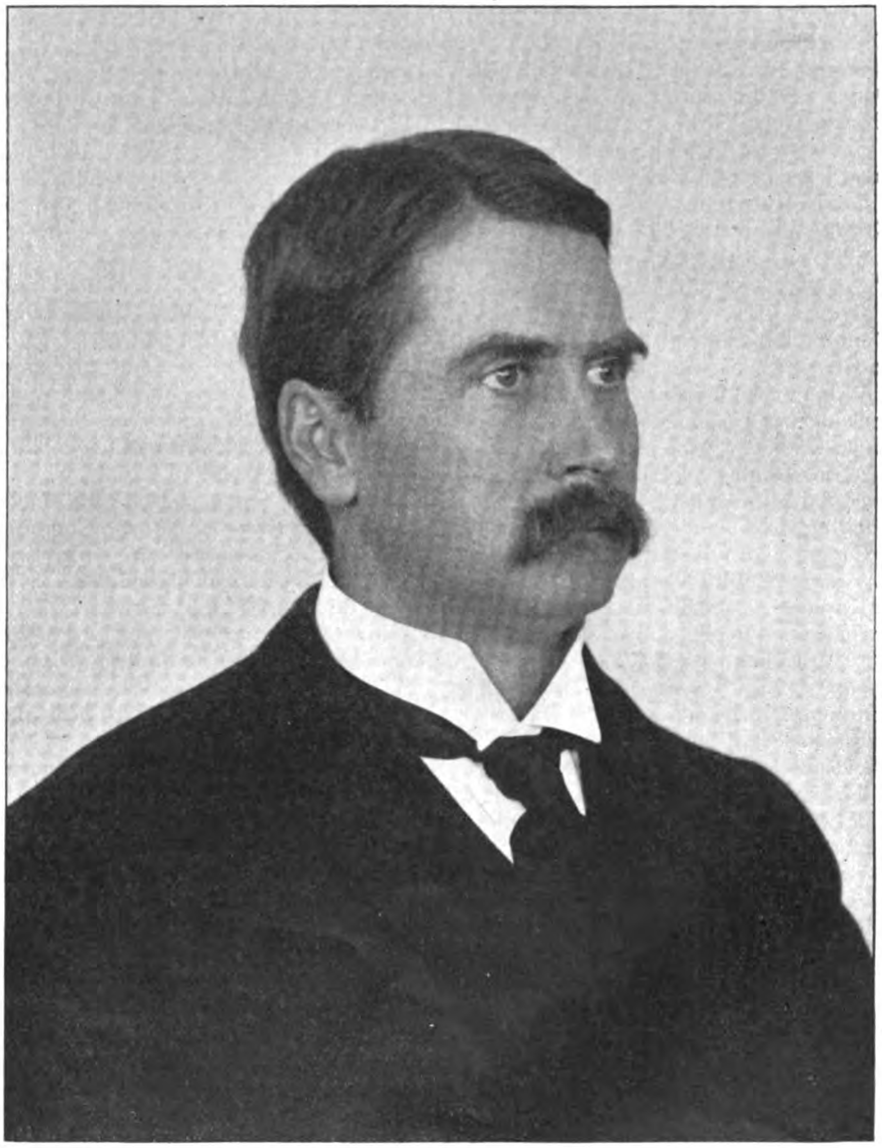
In deep water for the moderate speeds covered by the experiments the larger the midship section coefficient the better. As regards resistance it would frequently pay to adopt coefficients materially larger than hitherto used in practice.

In the very shallow water the midship section coefficient should be materially smaller than in deep water, but even for shallow water there seems to be no advantage as regards resistance in the very fine midship section of coefficients often used. A somewhat unexpected result found in shallow water was that the vessels having the finest block coefficient showed appreciably more resistance than those having fuller blocks. In view of the present limited knowledge of the exact influence of various features of form upon shallow water resistance it is pointed out that there are possibilities of great gain by special model basin investigations of important vessels intended for shallow water service.

The paper was discussed by Prof. C. H. Peabody, who stated that Mr. Taylor's investigations were more important than those presented by any other investigators except William Froude and his son.

Prof. H. C. Sadler stated that the results which he had obtained personally in shallow water confirmed those of Mr. Taylor.

Stevenson Taylor:—It is impossible to discuss this paper, excepting by those who have performed the same sort of experiments. The charts show all the results which have been obtained from these experiments. They are especially interesting, and are particularly so to me, who has followed the building of our Sound steamers for so many years. It is interesting to note that the model represented here, 60 per cent block coefficient and 98 per cent midship coefficient, corresponds very closely to the old steamers, the Priscilla and the Providence, which were, in their day, the greatest advance in the construction of that class of vessel at that time, or since then. These lines have been followed very closely from



NAVAL CONSTRUCTOR DAVID W. TAYLOR

that time to this, and they were built with a dead rise of 3 in. in 24 ft. You will notice in this chart that that model to which I have referred shows up most satisfactorily, both for deep water and shallow water, as compared to the others.

Joseph H. Linnard:—I have been very much interested in this paper, and what I wish to say is more in the nature of an inquiry than anything else. I notice that in Mr. Taylor's experiments only one shallow draft was used. I dare say that time and pressure of work in the basin, or other circumstances, were such as to prevent a series of experiments at different drafts. I think it might be interesting if Mr. Taylor would state something of the nature of the false bottom used, and whether it was considered that additional information of an important character would be derived from a series of experiments at different drafts.

Harold A. Everett:—I ask Mr. Taylor if, in his judgment, the results would be affected if block coefficients greater than 68 were taken, perhaps 78?

D. W. Taylor:—As regards Prof. Sadler's statements, I was very glad to find that his results have confirmed those we found, because he has done a great deal of this shallow water work and we have done very little, and the results were rather unexpected. So I am glad that we are in agreement on that point at any rate. We have found in most of our work before this, which was confirmed by these experiments, that, strange as it may seem, the rather full midship section is so advantageous from the point of view of resistance, that I am glad such an authority as Stevenson Taylor agrees with that in regard to the professional practice. Many people who build vessels are not willing to go so far in that direction, as might be indicated would be desirable from the results of the model basin experiments.

As regards Prof. Everett's question, if you examine the diagram you will see that the reduction of resistance has apparently reached its limit at a block of 64. For the blocks 68 there is a very slight increase, and I should anticipate that if we had carried these experiments in this particular case to a block of 78, driving the 78 block in the same manner, there would have been a very appreciable increase, probably a material increase, over the 68. The minimum probably occurs somewhere between 64 and 68. With reference to Mr. Linnard's question about the false bottom, it is a fact that time would not admit of the experiments being made at more than one draft, in fact, we were barely able to finish the shallow water experiments in time to have the paper in the hands of the printer in time for publication. The false bottom used was the bottom made originally for some experiments for the New York Harbor line board. They wished to have some experiments made of the disturbance of the water caused by the passage of ships through shallow water. It is 200 ft. long, and simply a plain wooden bottom, an inch thick, made in sections about 5 x 8 ft., and secured to steel beams which are heavy enough to hold it down. It is arranged so that we can put it in in two days and take it out in one day.

We have had other experiences with false bottom, and we find in towing these models, that the model which has a resistance of only one or two pounds, exercises a very strong upward suction on the bottom, when it is close to the bottom. We found it necessary to use 15-inch I-beams, quite stiff, placed 10 ft. apart, so as to make sure that the bottom does not rise up and attempt to lift the model. The upward flow resulting from a comparatively small horizontal flow is surprising.

Experiments on the Fulton

Prof. C. H. Peabody Relates the Results of His Experiments With Bilge Keels

THE second paper read was Prof. C. H. Peabody's paper on the subject "Experiments in the Fulton; Effect in Bilge Keel", abstracted as follows:

The experimental boat Fulton was used during the past summer to investigate the resistance of bilge keels, for which purpose it was well adapted both by the precision of results possible and because the stream lines are known.

The normal bilge keels were made 15 ft. long and 3 in. deep; bilge keels 6 and 9 in. deep were also tested. Tests were made in addition on keels 3 in. deep and 19 ft. long.

The apparatus on the Fulton is that described on page 87, volume 19 of the Transactions. The primary observations taken were (1) time on the course, (2) thrust of propeller, (3) revolutions of the propeller, and (4) input to the electric motor.

The assembling of results was conveniently made by plotting all observations with revolutions for abscissae. Sample curves are given of (1) speeds in knots per hour, (2) thrust of the propeller shaft in pounds, and (3) input to the electric motor in kilowatts. The first curves show a slight current at times, due probably to a wind acting before the tests; this current was in all cases less than a tenth of a knot per hour; it necessitated runs both with and against the current, from which the mean speed was definitely determined. The thrust was found to be practically the same for a given number of revolutions in all cases, with bare hull and with the several keels; consequently the thrust curve was well located. The determination of power (input to motor) was quite satisfactory; tests made at an interval of two weeks gave identical results.

In order to obtain results as indicated it was found necessary to run only when weather conditions were ideal; though such conditions might come at any time, day or night; the conditions were most frequently found at four o'clock in the morning.

The results of the experiments are reported in two forms:—

(1) The ratio of the increment in propeller thrust due to the addition of a given pair of bilge keels, to the computed frictional resistance of the keels.

(2) The ratio of the increment in power on account of the addition of a pair of bilge keels, to the computed power to overcome the friction of the keels.

In connection with the presentation of the paper, Prof. Peabody said: "I wish, in addition to referring to some of the items which are given in the abstract, to call your attention to a few of the figures. Having the Fulton and the means of measuring the thrust

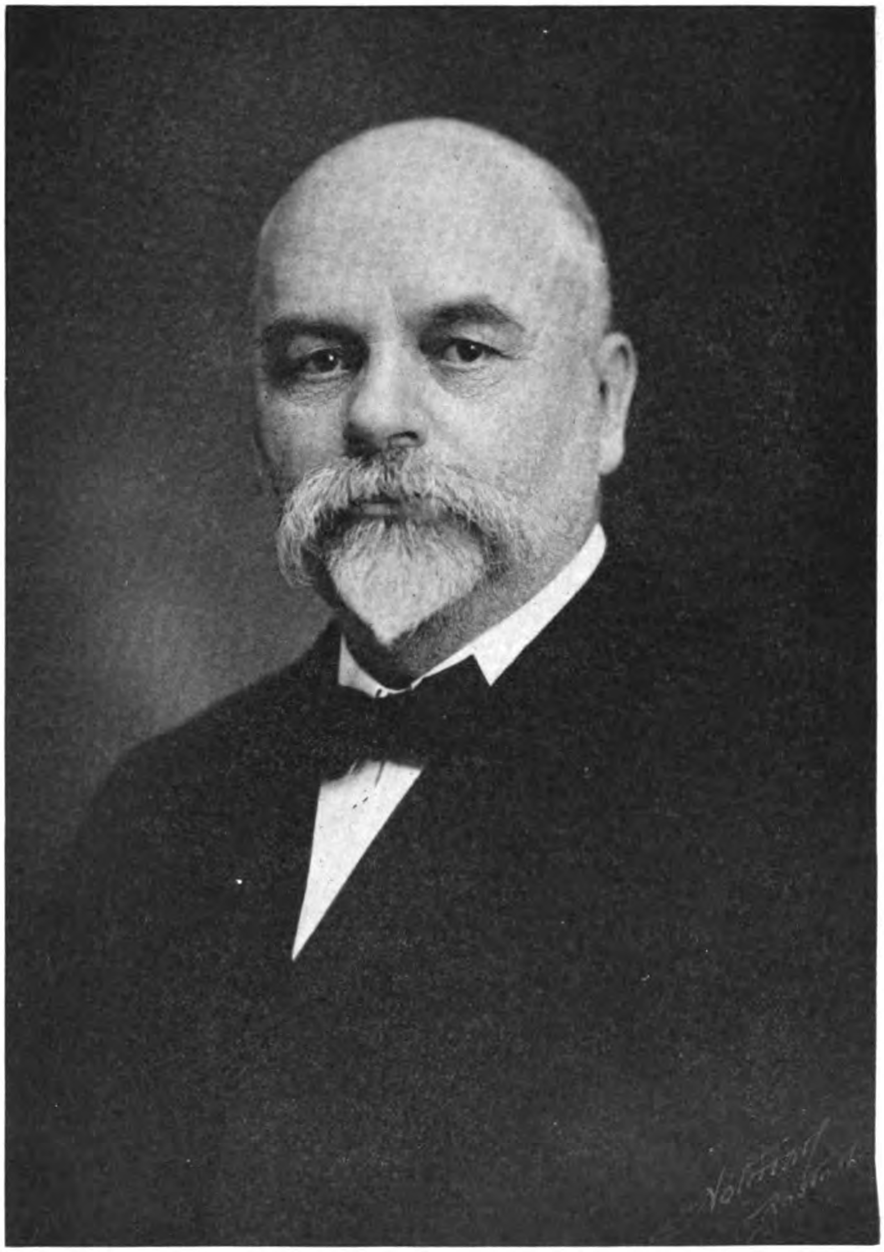
of the propeller shaft and the power delivered to it with considerable accuracy, it seemed desirable to deal with the subject of bilge keels. So bilge keels were put on a boat which had been tested without bilge keels. The keels were carried to a depth of nine inches, which is three times more than the ordinary depth for the proportion. In order to justify the work as presented, I wish to call your attention to a diagram which is presented on plates 2, 3, 4 and following. The first three are presented as samples, every condition having been tested by itself, and the results being assembled in that manner. On plate 2, the first appearing in the paper, we have a diagram showing the relation of the speed in knots for revolutions of the shaft. You will notice that there are two sets of points, small black points and the small circles. The first represent experiments made on July 28 and the other represent experiments made on Aug. 12, with conditions the same, except that between these two dates there had been a change made in that the bilge keels were lengthened, and then the extension pieces were removed, so that on those two dates the boats were supposed to be in the same condition. The boat had, meanwhile, been hauled up. Both sets of points are well represented, I believe you will agree, by the line which is drawn.

Time of Making Tests

"You will find some dispersion of the points, that is due entirely to a current in the basins, which current was evidently produced by wind which had been blowing and had ceased blowing somewhere from eight to twelve hours before the test was made. We had to choose an opportune time for making the tests, when the wind did not blow at all, or when there was only a fair trick.

"On plate 3 we had plotted a scale of revolutions per minute of thrust of the shaft in pounds. This represents one series of experiments, and we found, as would be expected, that this same curve represented properly all of the several series of experiments, because there is no reason why small changes made in putting on and taking off bilge keels should affect the thrust for a certain number of revolutions.

"On plate 4 we have in like manner the power as measured at the input to the electric motor. We have here again the black dots and the circles, all of which lie on the curve, because this relation was not influenced by the small current. It is interesting, in passing, to note that this is a delicate way of measuring very small current, but I do not know of any other method, which is available for measuring such currents with such a degree of delicacy.



PROF. CHARLES H. PEABODY

"Having presented these sample cases, it is but fair to present also on plates 5 and 6 certain experiments, the results of which were not so good, and these we may present as the worst of those which we secured. On plate 5, near the top of the curve, some of the circles do not lie so well on the curve as we should like. At the time when these experiments were made a breeze had sprung up and died away again. I cannot assert that the deviation is due to that. The deviation is not of serious importance. On the other hand, on plate 6, at the top of the curve, there is a deviation for which we offer no explanation. It is in this case to be charged only to unavoidable errors of our experiments; but since this is the determination of the thrust curve, which is in a sense the best located curve, we may fairly attribute this to unavoidable errors, and not consider that they indicate any defect in our test.

"On plates 8 and 9, certain results are assembled—on plate 8 thrust in pounds, as determined from the preceding curves, and on plate 9 we have the power as delivered to the propeller shaft, proper allowance having been made for the friction.

"This work may be summed up as given on page 2: 'For speed less than that corresponding to a speed length ratio 0.7 the increment in

thrust corresponded well with that in at higher speeds the resistance was greater than that due to friction up to a ratio of 1.5. The increment in power due to addition of bilge keels was notably larger than the power computed from the friction of the keels, the ratio varying from 2.5 to 3.5, the larger ratio being found at the higher speeds. The discrepancy between results from thrust and from power cannot be charged to error or uncertainty of observations or to methods of reduction, but is a real difference.'

Work of Associates

"I wish also to take the opportunity to speak of the singular devotion to the work of my associate, Dr. Everett, and it should be noted that since we needed for these experiments practically perfect weather, the experiments had to be made when the perfect weather came, which is very apt to be at four o'clock in the morning.

"I wish also to refer to the acknowledgment at the end of the paper which is due to Henry A. Morss, Lewis Crossett, Frederick C. Fletcher and Herbert M. Sears, for their assistance in providing for the expense of the work and also to Harrison Loring Jr., who provided the transportation."

William Gatewood:—In connection with this paper I would like to say that it is my recollection from the results of the experiments in the Washington model dock on bilge keels for battleships that these results are not borne out, that the power required was almost entirely that which could be attributed to friction.

Elmer A. Sperry:—I think the paper is very interesting, and there is one point in connection with plates 8 and 9, which I would like to bring up. Of course, we must realize that the actual speed under which this work is done is rather small, yet the upper part of these curves are quite significant. You see in both plates 8 and 9 that the curves are tending quite rapidly to disperse, showing more relative resistance at this point than at the lower speeds. Now, were these curves projected up into commercial speeds, of 15 or 20 knots an hour, we can only guess what would happen. It would seem to me that the greater dispersion between the first and second lines there might be explained by a phenomena that we are just commencing to understand in connection with resistance in air of much more rapidly moving bodies than this, relatively, and that is the augmenting of the apparent resistance due to the corner, so it seems to me it might be well if Prof. Peabody would tell us a little more as to how these bilge keels were attached, whether there was a fillet at the junction between the steel and the hull, a little more as to detail so we could judge what, if anything, this factor of eddy resistance in the corner may have.

E. A. Stevens Jr.:—I would ask the gentlemen who have tried experiments on this subject, if the bilge keels vary in proportion to the beam over length. Capt. Dyson in the last of his articles on screw problems, which appeared in a recent issue of the *Journal* of the naval engineers, gives a set of curves where the resistance varies according to the beam divided by the length. It is not a curve, it is a straight line. I presume he has obtained this from the tank experiments in Washington, although he does not state so.

Resistance Varies

Another question I would like to ask is, if the resistance does vary as to beam divided by length, whether any difference occurs on a ship of such a model as a freighter, which has a parallel body, and the bilge keel is practically a straight line where attached to the ship, in some cases it is; in fact, we had a ship in the dock yesterday where the intersection of the bilge keel was a straight line. The parallel middle body of the boat must have been about 60 per cent of the length, with the ends eased away. On the other hand, in a model such as a yacht, which has no middle body, the intersection of the bilge keels with the hull is a curved line. According to Capt. Dyson's chart, the resistance of the bilge keel would be the same for these two models. I ask, has it been found that the resistance of the bilge keels would be the same for these different models, where the beam divided by length was the same?

D. W. Taylor:—Mr. Peabody calls attention to the fact, and it is a fact, that in most of our experiments with models we found the increase due to the installation of bilge keels not much, if any, more than that due to friction. That is generally the case, in fact, there have been cases where it has been hard to get a difference equal to the computed frictional difference. You may remember that in the classical experiments of Mr. Froude on the Greyhound, when he towed an 800-ton vessel, he found the same condition, that the resistance of the bilge keels was scarcely up to that of the friction. The probability in this case is that the bilge keels have some influence upon the propulsion efficiency, particularly very deep bilge keels have probably changed the flow of the water, so that there is some effect different from the natural resistance. We measured in the model basin simply the resistance of the model—that is a case where the thrust is measured. But there is another factor present. There is a case of a United States battleship which some time ago was tried with bilge keels. The bilge keels were afterwards removed and the ship was tried over the same course, same displacement, same conditions as nearly as possible, and the ship took materially more power for a given speed with the bilge keels off—it was a matter of fully 100 h. p.—and although the experiments were not of a high order of accuracy there was no doubt that there was more power taken when the bilge keels were off. That was something of a puzzle, but the answer, I think, is comparatively simple—the vessel did not steer nearly so well after the bilge keels were removed, and in running a trial, in trying to keep the ship to a straight course, they use more helm with the bilge keels off than with the bilge keels on. It takes only a very few degrees of helm to make a very decided drag on the vessel and increase the resistance. It has occurred to me that possibly the use of a helm may explain some of the discrepancies in these experiments, if this boat was tried in sea water and they necessarily had to use a helm to keep a straight course. That is a factor which is ignored sometimes, but not ignored by the contractors when they want to get the best speed out of the ship on a trial trip. They always use a good helmsman and see that he uses as little helm as he can possibly get along with.

The Washington Experiments

Prof. C. H. Peabody:—I perhaps did not catch the point made by Mr. Stevens. I failed to find out whether he asserted that the experiments at Washington showed that the resistance did or did not increase proportional to the friction with the use of bilge keels. What I wish to say in regard to this is that the experiments were carried on here, not only with the normal bilge keel, but with a bilge keel which was three times as deep as a normal bilge keel, and that the reports are based upon an investigation of all our experiments, the actual computation having been based upon the deepest keel, namely, 9 in.,

but the curves on plates 8 and 9 will show, particularly on an average from one curve to the next, that whatever we could attribute as the increase due to the 9-in. keel could be assumed to vary in that proportion for the 3-in. keel. I believe that even if my wording is not as good as I would like, that you get the conception.

Now, we have found also that with the best work that we can do it is very difficult in this case to determine the amount of resistance closely enough, so that one could assert from the experiments on the 3-in. bilge keels only that the resistance did or did not increase proportional to the friction. We put on the 9-in. bilge keels purposely so that we should be able to get a better determination. We also extended the bilge keels to make them strong, some 19 ft. long instead of 15 ft. long, and I report no result, because we got no result, namely, we got practically the same thrust and power with and without these extensions to the bilge keel. If we compute the added resistance for the increment in length of the 3-in. bilge keel, we will find that amounts to about one pound and a half, and our thrust mechanism will move with an increase of about 2 pounds, and so you will see to get this result does not signify very much.

Dispersion at Full Working Rate

As to the question raised by Mr. Sperry, I may note that the prototype of the Fulton is the Sotoyomo, a navy tug, with an approximate speed of 10.3 or 10.4 knots per hour, and that the curves given on the several plates, which extend only to 6.5 knots, are in the proper relation, by the theory of similitude, so that these diagrams show the dispersion at the commercial rates, at the full working rate. But I believe it to be practically impossible to propel the Fulton, with any development of power you will put into her, up to 15 knots. What the curves would do in that case would be difficult to predict, and not particularly useful. There has been a question raised as to how the bilge keel were put on. They were made, as stated in the body of the paper, of good three-quarter in. thick oak, and were bolted on without any fillet, which corresponds, as nearly as our scale would admit, with the ordinary practice.

I did not understand the question raised by Mr. E. A. Stevens Jr., or else I do not see how it is possible to answer it. As I understand it, there is some question as to the effect of ratio of beam and depth on the ship as to the bilge keel for that ship. Of course, we cannot produce any answer from the experiments which were all made on one particular boat. Failing a proper reply, if Mr. Stevens will kindly make his question clearer to me, I shall be glad to answer him at length.

E. A. Stevens Jr.:—I asked if you had any information as to whether the resistance of bilge keels increased in proportion to beam over length of the ship?

Prof. C. H. Peabody:—I am very sorry to say, Mr. Stevens, that our experiments did not shed any light upon that question.

An Unsinkable Ship

Mr. George H. Dickie and William Gatewood Contribute Papers Upon Somewhat Similar Lines

THE third paper read was George W. Dickie's paper "On the Possibility of Building a Large Passenger Liner That Would Not Under Any of the Known Mishaps at Sea Lose Her Buoyancy or Stability and Sink", an abstract of which was read by Secretary Cox, as follows:

This paper seeks to point out a possible solution of the above problem as applied to a certain type of vessel, viz.: the large, modern, passenger liner. New and ever-increasing laws concerning life-saving appliances have created a grave problem for the naval architect, both as to carrying heavy top weights and littering a large area of deck space with life boats and rafts. In brief, the suggestions embodied are the fitting of a double upper deck and so arranging the watertight subdivision below the lower member of this deck that the ship would prove both seaworthy and unsinkable under the most aggravated conditions of flooding. The advantages to be considered in this arrangement as opposed to the drawback of wasted space are as follows: The space between the two members of the upper deck would be utilized for cold storage rooms, air ducts, water and steam piping, stores, etc. The fire mains would at all times be under direct control. All horizontal piping and ducts through living spaces would be done away with. Communication to and from engine room, fire rooms, dynamo room and ventilating and refrigerating rooms would be through a continuous watertight passage fitted with automatic watertight doors which would operate from the influx of the sea. In a ship so constructed and practicably, at least, unsinkable, would it be necessary to carry the great number of life boats now deemed necessary and which, with the great freeboards of our ocean liners, are utterly useless except in the event of a moderate sea and the speedy arrival of assistance?

Structure of Vessels

As William Gatewood's paper, entitled "Structure of Vessels as Affected by Demand for Increased Safety", was along similar lines it was deemed best to read it before Mr. Dickie's paper was discussed, being abstracted as follows:

In this paper it is suggested that the basis for further precautions, which ought to be taken in the structure of vessels as a result of the demand for increased safety, should be the number of lives involved; and, further, that greater precautions should be taken for the lives of the passengers than for the lives of an equal number of the crew.

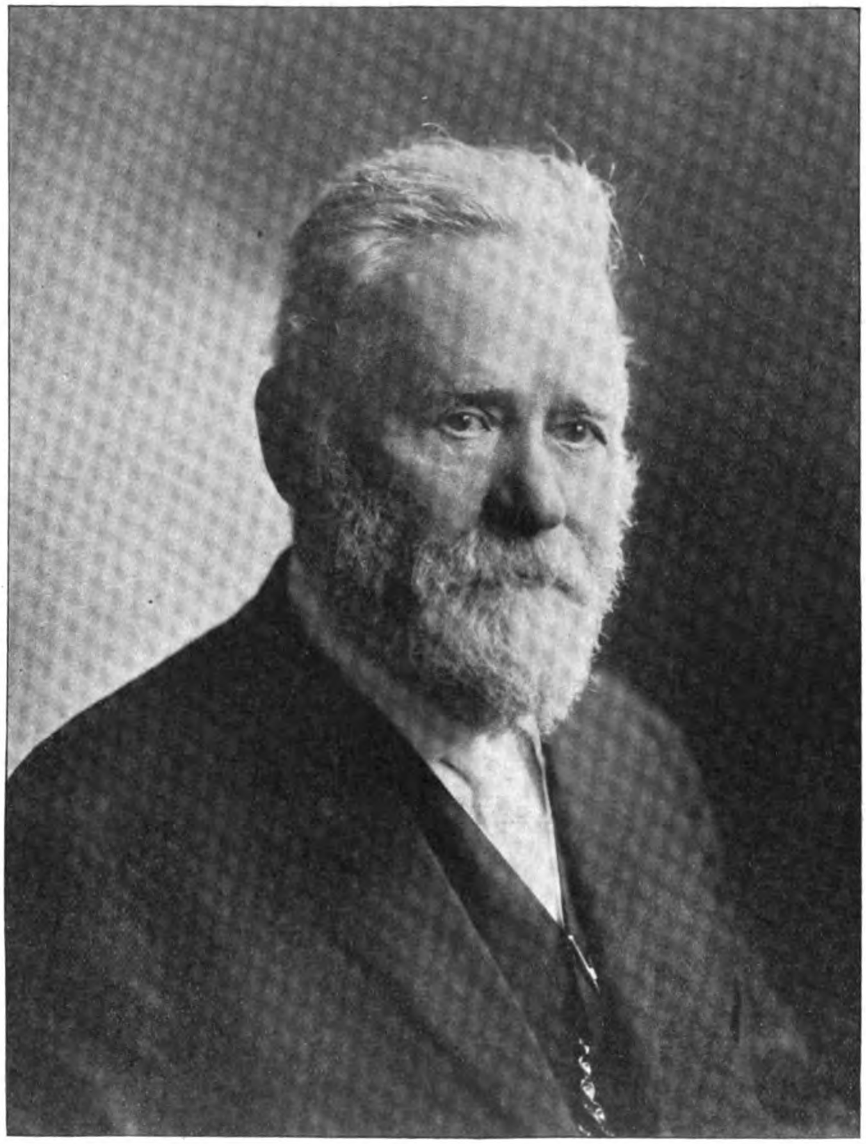
It is suggested also that the propelling machinery should be protected by a double bottom and, where a large number of lives are involved, by wing compartments.

It is further suggested that subdivision by transverse bulkheads, combined with suitable freeboard, is the logical method of preserving buoyancy and stability; that the proportion of the length of the vessel which may be damaged without danger of foundering should regulate the spacing and height of the bulkheads; and that for a coastwise steamer of standard type, carrying passengers small in number compared with the Atlantic liners, no other subdivision would seem necessary.

Steel hatch covers are recommended for fire protection.

R. H. M. Robinson:—In reading Mr. Dickie's paper I am quite impressed with the idea that his watertight deck is very much the same thing as was proposed by Marsden Niles, who was formerly a naval officer, who presented a paper before the senate committee at the time of the Titanic investigation, the only difference being that he wanted one of these decks to be on every deck, and the result was very much exaggerated. I cannot help but agree entirely with Mr. Gatewood in his belief that the amount of protection should be proportional to the number of lives involved. It seems to me that if we put the same amount of expense, for the safety of the ship, in a ship which carries only cargo, and in which the crew must naturally assume the risk of the trade, that that is quite a different thing from protecting the lives of a large number of passengers. I suppose practically all the ideas in these papers have been taken up by the International Committee that is now sitting in London, and I imagine that as a result of that International Conference there will be certain laws proposed in America. It seems to me that this society should take a very active interest in the preparation of any laws that may be proposed as affecting the building of ships, the design of ships, and the operation of ships. I have no doubt that the department of commerce will probably be charged with the preparation of these laws, and will be glad of any suggestion from the society, and I think the society should take it on itself to offer its services in connection with that matter, because any laws that may be passed will be of very great importance.

There is one thing which nobody has touched on here, which seems to me in many cases would contribute very largely to the safety of ships, and that is the installation of a compressed air system. This is not a very difficult thing to do, particularly on a passenger ship, where there are numerous decks. Something of that kind has been put in several of our battleships, and it is a matter of such great simplicity it can be combined with the fire protection feature and you can utilize the pipes, to a great extent at least, that are already in the ship. Probably on a single deck cargo carrying ship it would not be easy to put in, but on a ship with several decks, where the pressures could be graduated from the bottom up, it seems to me to be such a large step toward a solution of the problem. Mr. Gatewood's suggestion of the application of steel hatches for fire protection would tend to make this thing even more easy.



GEORGE W. DICKIE

Prof. H. C. Sadler:—The question is really a rather complicated one because we can attack it from so many points of view. In any ship we have varying permeabilities, as it has been called—that is, when a compartment is flooded, that compartment may contain machinery, engines and boilers or cargo, of different densities, or passenger accommodations. We can average up these permeabilities and make our flooding calculations accordingly. After we fix the permeability of different compartments then we ought to allow a margin of safety, to be determined by the experience of people who are handling ships, naval architects and others, but the margin of safety must be fixed in connection with the permeability, the space varying, or, as has been done, we can assume the vessel will go down to about the middle, under any conditions, and then we can vary the permeability according to the type or size and speed of the vessel. All these are factors which come into this question of floating. The size of the vessel, of course, is also important, and in general a larger and higher speed vessel, should have a greater percentage of freeboard than the smaller and lower speed type. From my own point of view I feel that it is the more rational thing to fix an average permeability in the cargo space, and then allow a percentage of depth as freeboard, or a margin of safety line, below which the vessel should never go under any conditions of flooding.

With regard to the bulkheads themselves, it is absolutely essential, if you are going to put in bulkheads, to have them do their work, and I think, perhaps, more attention will be paid to the strength of bulkheads in the future than has been paid in the past. There is no use putting in a

bulkhead unless it is a real bulkhead.

Mr. Gatewood mentioned something about wing compartments. I think we should go rather slowly with reference to wing compartments. It is a question in my mind whether a wing compartment is of great value. It forms a second line of defense, but unless there is some means adopted to connect the wing compartment to the corresponding wing compartment on the other side of the ship, they may prove a positive danger, that is, the vessel may lose her transverse stability sufficiently to capsize, so that the longitudinal bulkhead is not, in my opinion, an added means of prevention of sinking, unless it is kept rather close to the ship's side itself.

J. G. Tawresey:—Both of these papers are by gentlemen who can speak with authority on the subject. There is one rather unusual circumstance in connection with the preparation of Mr. Dickie's paper, that should make it of special value to the society, and that is that the paper was actually written at sea where the conditions and the limitations, especially the limitations, are very real, more so than they are on the blue prints stretched on the drafting board. Mr. Dickie's long experience of a life time spent in designing and building ships, spent on both warships and merchant ships, qualified him to observe these conditions.

I note that, perhaps leaving out some of the details, the broad conclusions in the paper are somewhat identical, and both of the writers seem to take the view that has been taken in the navy, that the effort should be to make the ship herself safe rather than to depend on boats, and the methods adopted are practically the only ones that can be adopted, namely, subdivision bulkheads, double bottom, and by cellular compartments at the waterline. In some ships in the navy, they are confined more to the compartments at the side of the vessel, whereas Mr. Dickie's paper seems to divide the whole space between the decks into small compartments.

Center Line Passage

We also note the reappearance of the center line passage, Mr. Dickie's favorite center line passage, except in this case he moves it higher up. The question is—can the usages in commercial practice be modified to make a ship of this character satisfactory to the owners and to make it financially successful? I am rather surprised to find a man who has been so intimately connected with the merchant service proposing to sacrifice, unless he can find some way of using it which does not appear to me, so much space to protect the ship's buoyancy and stability. He has gone quite as far as a [illegible] architect goes in designing [illegible] vessel.

D. W. Taylor:—I did not propose to mingle much in this discussion, but in reading Mr. Dickie's paper there was one thing which puzzled me very much. It may be a clerical error. You will observe in his plate he gives the longitudinal section of the ship, and that deck which slopes down at each end he calls throughout the upper deck. I was aware in the mysterious system adopted by the Classification Society that the upper deck was never the highest deck, but did not know that it had gotten into the hold yet, and I am wondering whether there is not a possibility of some confusion as regards that matter.

Horizontal Watertight Compartments

I observe that Mr. Dickie's tendencies run largely to horizontal water-tight compartments. Apparently Mr. Gatewood scorns water-tightness, it would appear. I am glad Mr. Dickie has come forward with a design in which he relies so much upon the horizontal watertight compartments, because I several times advocated in the past in some of these very large vessels the fitting of a watertight deck forward and aft. One of the great dangers is the pronounced change of trim, and if in any way you can confine the water horizontally, the change of trim is reduced. You avoid the necessity of putting water in aft at times. I have been met by the statement that it is not commercially possible to equip watertight decks. It would seem to me with these large liners, these very large vessels, there is in the neighborhood of the water line an actual line of demarcation between the inhabited part of the vessel and the part of the vessel devoted to cargo principally, and it should be possible to make that line of demarcation watertight and to protect the integrity of the watertight deck by enclosures running up above the bulkhead line. I hope Mr. Gatewood will give that matter attention after consideration of Mr. Dickie's paper. Mr. Dickie has spent his lifetime in commercial work, and he would not advocate so large a horizontal watertight subdivision unless he believed it commercially practicable.

Aldin D. Welds:—There is one point I would like to raise—I do not know whether it has been brought out in this paper or not—and that is in connection with the protection against fire by the use of flue gases in the boiler. I believe this question has come up before the Naval Architects of Great Britain. In port the flue of the donkey boiler can be used, and, therefore, there is protection always at hand. At sea the funnel of the main boilers would be tapped, and the equipment in the Harbor system, which is the British system,—patented for this service, consists of a De Laval turbine driving a fan, and there is a washer which uses sea water for cleansing the gases. The flue gases consist of about 80 per cent of nitrogen, something like 10 per cent of CO_2, and at most 1 per cent of carbon monoxide, a very poisonous element, and about 9 per cent of oxygen, and as it requires 15 per cent oxygen to support combustion, it is an inert gas.

One difficulty, perhaps, is that it is so light, being as compared with air about 1.05, but I believe in the navy carbon tetrachloride is used experimentally, with some success, and that, I think, is about five times as heavy as air, and, of course, it would be much more rapid, but with the use of a fan I do not see why it could not be blown into the hold as quickly, and being always available as flue gas, you would not be taking any power from the ship, as would be the case if steam were used.

Avoiding Watertight Doors

Joseph H. Linnard:—I note the statement in Mr. Dickie's paper as follows: "There would be 12 bulkheads extending from the inner bottom to the upper deck. These would be absolutely watertight, without doors or openings whatever." I think most of us who have been engaged in building ships, especially men of war, know the great desirability of avoiding the use of watertight doors or similar openings through bulkheads that are supposed to be watertight. Such watertight doors, even though fitted originally with great accuracy, and when tested found to be in perfect condition, yet in the course of service, where they are apt to be left open for long periods, are found, when the emergency comes, to be very unworkable, or if workable, far from watertight, owing to distortions that have occurred and have not been corrected. Therefore, it has seemed to me that if it is feasible, that is a very important point in fitting the transverse bulkheads particularly, which, as has been remarked this morning, are the main subdivisions that appear practicable and to be made without undue expense. But particularly with reference to such transverse subdivisions in the machinery compartment it has been found difficult to preserve such absolute watertightness without any openings fitted with watertight doors.

In fact, I was an ardent advocate myself of such methods of construction, and several of the warships of the navy were fitted without any watertight doors in the transverse bulkheads in the machinery compartment it has ence has shown that the pressure of daily inconvenience overcomes the remote improvement in safety, and in the course of time I believe every one of those ships had watertight doors fitted into transverse bulkheads in the machinery spaces. I think any consideration of watertight subdivisions that leaves out the tendency of the seagoing man to search for immediate convenience at the expense of ultimate safety has to be carefully considered.

Safety of Ships

E. H. Rigg:—In Mr. Robinson's remarks on this paper by Mr. Dickie, I was glad to hear him suggest that the society should take an active interest in whatever is done in the matter of providing safety for ships. The record of the society shows it has always taken an active interest in such matters.

Prof. Sadler mentioned the importance of strength of bulkheads. The records of our socity contain a most excellent paper on bulkheads by Prof. Hovgaard. I think his paper is recommended as a standard. I mention this to show that the society has always been active, and I hope the society will maintain that interest.

The department of commerce has recently been conducting investigations into the subject of bulkhead subdivisions, with a view to taking part in the present conference in London. The British government, in 1891, had a bulkhead committee, and that bulkhead committee made an excellent report, which is of great value today. The present bulkhead committee, which is distinct from the conference work, will probably report further progress.

I imagine Commander Robinson's idea was (and my own would be) not that he had any idea of the society being indifferent to these matters, but that the society should take an active and aggressive movement with the department of commerce, and not merely have good papers on record. but to have some one go there and cram the contents of these papers down the throats of the people in the department.

R. H. Robinson:—That is exactly what I believe in.

A. P. Lundin (Communicated):—I have read Mr. Dickie's paper with much interest, and regret that I could not be present and take part in the discussion. I admire Mr. Dickie's courage as regards his plan for an unsinkable and fireproof ship. I wish him every success in constructing such a ship and trust that when it has been completed, it will stand thorough demonstration of the correctness of Mr. Dickie's theories. If actual tests prove them correct, I think that steamship operators and financial interests backing the "unsinkable, fireproof ship" enterprise, should be willing to show their confidence by taking out no insurance on a ship of this type, nor on its cargo. I believe that such a show of confidence might tend to influence the authorities as well as the general public to consider ocean travel without lifeboat equipment.

It seems to me that it would be to the interest of safety at sea if—until the unsinkable, fireproof ship is really an accomplished and proven fact, ship owners and naval architects would give due attention to the quality and efficiency of lifeboat equipment and the handling of lifeboats in rough water as well as in a smooth sea, in other words, lifeboats should be provided which will stand being thrown against the ship's side without smashing and also make it possible to carry the requisite number of boats without encroaching unduly on the deck space, while representing less actual weight per person carried.

Here in the United States we have ships so equipped; for instance, some of the army transports. Formerly these ships of moderate size, had lifeboat capacity (including rafts) for only 700 to 800 persons, while with their new, up-to-date equipment they can take care of 2,000 persons, the full complement of persons carried, in practically the same deck space. The additional weight of the new equipment does not seem to have affected the stability of the transports, although they are old and narrow and were not designed originally for this added equipment.

Efficient Lifeboat Equipment

Certainly the increased weight of really efficient lifeboat equipment is a mere bagatelle as compared with the increased weight of such a design as proposed by Mr. Dickie.

A most important factor in connection with safety at sea is that officers and crews of ships should be properly trained by actual drills in the handling and launching of lifeboats; therefore, it is decidedly important that the equipment be as complete and up-to-date as possible in order to facilitate and encourage such drills.

It is all very well to say that lifeboat equipment will be of service only in exceptional cases, but we should also consider the great amount of use for small boats every day—whether the water be rough or smooth; for instance, in embarking or disembarking from ships which have to lie in open roadsteads, where there is no harbor; also in the work of cable ships and fishermen.

As regards the added cost for such equipment, I think where the question of safeguarding human life is involved, this is certainly not great when compared with the premiums paid for insurance on ships and cargoes.

Automatic Buoyancy

Until, by actual tests, the contrary has been proved, I contend that it is advisable to have proper lifeboat equipment on the most modern passenger ships, even as the most modern fireproof buildings are still provided with fire escapes, and my contention is upheld by the fact that ship owners, as well as owners of buildings continue to insure their property.

William Gatewood:—In reply to Mr. Robinson's discussion of the paper, I would like to state that it seems to be much more important to so subdivide the vessel that it will automatically take care of the buoyancy and stability of the vessel, rather than to depend on the pumping in of compressed air, which, under all circumstances, must be a matter of considerable time and of preparation.

It will be noted that my paper is devoted primarily to the conditions which arise in the United States in the construction of vessels, and does not enter upon the wider discussion of the Atlantic liners; but it would seem that a further subdivision of Atlantic liners carrying a large number of people, principally of passengers, would be in order over and above the subdivision of transverse bulkheads. To obtain this subdivision mere longitudinal bulkheads have grave defects, due to the destruction of the stability of the vessel, and the introduction of watertight flats or decks is open to objection on anything except a purely passenger vessel, on account of the difficulty of utilizing the spaces below this deck for the carrying of cargo without great inconvenience. On the other hand, on the purely passenger vessel, it would seem to me that the introduction of watertight decks, rather I should say the introduction of watertight compartments, separate and distinct from the shell of the vessel, which could be formed by means of two watertight flats and two longitudinal bulkheads, near the center of the ship, to limit

the amount of water which would enter in case of a collision (which, it seems to me, is the great danger to which these vessels are subjected), would be an advantage but the scope of my paper hardly covered the trans-Atlantic liners, so that it is only hinted at in the paper.

In reply to Mr. Sadler, I would state that it seems to me that the interest which the United States takes in the International Conference of Safety at Sea is not the interest of the naval architects, but rather the interest of the passengers, the traveling public, and that it is to be hoped that our representatives will look at it from that point of view and insist that in the case of those vessels where a large number of lives are involved the greatest subdivision which is practicable shall be insisted upon.

In reference to the wing compartments which were recommended in the area of the machinery spaces, perhaps the paper is not very plain, but the object of these wing compartments was to protect the control of the vessel, not to prevent the vessel from sinking, but a vessel at sea which is not under control is in a very much worse condition than one which is under control. By maintaining wing compartments abreast of the machinery spaces, it would limit the extent of the danger due to collision, so as to prevent it from interfering with the work of the machinery of the ship, which is of considerable importance and value.

Mr. Tawresey brought up the matter of the subdivision of the ships, this subdivision being satisfactory to the owner. It has been advocated by some ship owners, one at least, that transverse subdivisions will be a help to the stowage of cargo, not a hindrance. If such is the case, then efficient transverse subdivision as advocated in my paper should not meet with opposition on behalf of ship owners, except in so far as additional first cost is concerned.

Mr. Taylor's remarks rather took the horizontal subdivisions by means of decks, but I think I have replied to this in connection with one of the previous comments.

Construction of the Vessel

Both of these papers are primarily related to the construction of the vessel, and not in the additional precautions which should be taken in connection with safety in case of accidents, as to the prevention of fire by means of flue gases or the question of preserving the lives of passengers by means of lifeboats.

Mr. Linnard's remarks relative to the protection of the anticipated subdivision by limiting the number of watertight doors and other openings, it seems to me is strictly in order, and should be advocated or insisted upon wherever it is practicable to make such protection intact. That would be one disadvantage in a watertight deck, that it must have openings in it, which must be capable of operation, and the consequent danger of their being left open when they are needed, when they ought to be closed and watertight. That is all that I have to say.

R. H. Robinson:—I trust I was not misunderstood as recommending the substitution of compressed air for any other means of preserving the safety of the ship. I quite agree with Mr. Gatewood in everything he said about compartment building, and other means of that character, for preventing the loss of the ship. It was not so long ago that we were told that the Titanic was unsinkable, and that statement had the force of considerable authority behind it. It did not prove to be true.

My recommendation of compressed air was purely on the basis of a simple additional safeguard—after you had taken all the proper precautions, that was the simplest thing you could put on to add to them.

As to its taking a long time to use it, it is the thing upon which the submarine boats rely almost altogether for most of their operations, and it takes but a fraction of a second to open a stop cock and a very few seconds for the air to come in and blow the water out. If the ship is designed, and the installation put in with that operation in view, I do not think it would take any great length of time to utilize the system.

Adjournment was then taken for luncheon.

An Emphatic Protest

Is Leveled Against the La Follette Seamen's Bill by the Naval Architects' Society

AT THE request of the Council Lewis Nixon offered a resolution protesting against the so-called La Follette Seamen's bill, saying that it threatens the very existence of shipbuilding in the United States, and would end the flying of the American flag on the high seas. The text of the resolution follows:

"On Oct. 3, 1913, the United States senate passed Senate Bill 136.

"This bill is alleged to promote the welfare of American seamen in the Merchant Marine of the United States.

"This society does not concur in the view that a law which makes it impossible to fly the American flag on the oceans in the foreign trade is in the interests of the seamen of the country. It believes that legislation which will hinder the expansion of our coasting fleets and nullify much of the good that will result from the development of our deeper waterways is against the welfare of any of our people.

"It is our judgment that as the result of the enactment of this bill American vessels will be driven from the foreign commerce upon the Pacific, that trade will be driven to Canadian ports and that vast damage will be done to our transportation systems on land and sea.

"It believes that on account of the demoralization resulting from the false and misleading impressions to be created by such bill as to the relation between the seamen and the officers of our merchant vessels, the hazard of the sea will be greatly added to and that the safety of persons and conditions in transit at sea will be threatened.

"The bill is vicious selective class legislation based upon misrepresentation, and which defeats the very object that it is alleged to further.

"Therefore, Be It Resolved, That the Society of Naval Architects and Marine Engineers, representing the shipbuilding and allied interests of the United States, protests against the enactment of Senate Bill 136, as operating against the upbuilding of our merchant marine, reducing the opportunity of employment of American seamen, adding to the risk of life and property at sea and sapping the commercial independence of the

nation;

"That a copy of this resolution be sent to the committee having cognizance of merchant marine legislation in the senate and house, and to the secretary of commerce."

Stevenson Taylor:—In seconding this resolution of Mr. Nixon, I wish to add that, further than the destruction of our merchant marine on the ocean, that if this bill is carried out in its full extent as passed by the senate it will destroy in a great measure, not only all attempts at improvement in our ocean service, but will destroy absolutely many of the lines engaged in our sound, bay and river service. I have been looking to this matter and paying considerable attention to it lately, and I presume the majority of those present have done the same, and I heartily endorse the resolution, sincerely hope that it will be passed unanimously, and that it will be sent to the proper authorities today.

E. P. Bates:—Before we can vote intelligently on this resolution, it seems to me we should know more than the text of the bill.

Stevenson Taylor: — I presumed everybody knew the text of the bill. Briefly, it establishes a class called A. B. S., meaning able bodied seamen. To be an able bodied seaman, and to receive a certificate that one is an able bodied seaman, a man must have been three years on the deck of a steamer The law provides, also, that no person in one department of a ship shall be taken to do the work in another department. It provided that every lifeboat must have at least two so-called able bodied seamen. It provides that there shall be lifeboats on ocean steamers, and incidentally on the sound and bay steamers, to carry every passenger and every person in the crew on board the ship. There are other provisions, but I think I have already named sufficient of them to show the character of the bill.

No Able Seamen

We all know there are no seamen, as the term "seamen" used to be understood, on our steam vessels—that the persons on deck are merely deck scrubbers, brass polishers, painters of rust spots, and similar work of that sort. The old seaman, the man who could furl a sail, splice a rope, tie a bowline, take his trick at the wheel and steer the ship, has passed away. There are not such on our ocean, sound or bay steamers. We depend on the entire crew of the vessel to man the lifeboat; in other words, the stewards, the firemen, the engineer, are all part of the crew, and have to man the lifeboats, and are drilled in the handling of the lifeboats, and therefore the boats are well provided with crews at the present time. If you prevent one man in one department from going into another department, except in case of dire necessity—that is the wording of the law—we will have no right to demand that stewards and firemen, or any other member of the crew, but the deck crew, shall take part in the lifeboat drill or fire drill.

Vicious Legislation

"I think I have said sufficient to this body, the members of which are well acquainted with the needs of vessels, especially vessels at sea, to indicate that the bill is a piece of vicious legislation, purely class legislation, in the interests of what is called the Seamen's Union. I feel very strongly on this subject, and think any one who has given it any attention whatever will feel the same, and to my mind this society should take a stand against legislation of that sort.

"If there is any other point about this bill not clear to the people here, I shall be glad to elucidate the matter or answer any question in their minds. The bill is a vicious bill, and passed simply in the interests of the Union, a union of men that practically does not exist, that is to say, there are no seamen in the old time sense of seamanship. I hope this resolution will pass unanimously.

William E. Waterhouse:—I am in hearty sympathy with what Mr. Taylor said, and Mr. Nixon preceding him, and I would like to cite a specific case of the results of this bill. Three weeks from tomorrow contracts will be signed for three boats to operate between the Battery and Glen Island, and at the eleventh hour and fifty-ninth minute the attorneys for the bankers who are underwriting the project called attention to Bill S. 136, and said that under a strict interpretation of Section 12 of that bill these boats would be a losing proposition.

F. B. Smith:—There is another point the gentleman did not bring out in regard to the A. B. S. We might take the definition of an A. B. S. according to this bill—they must have served three years on the deck of a vessel —

Stevenson Taylor:—Ocean or lake.

F. B. Smith:—They might never have been in a lifeboat in three years, or handled a small boat in any shape or manner. A man brought up on the banks of Newfoundland, brought up in small boats, would not be accepted as an A. B. S., and would not be considered competent to take part in the handling of a lifeboat. A fireman, no matter how well skilled he is in the handling of a small boat, cannot act as a part of this life saving crew—he must have simply served three years on board of a ship, and then he is competent, whether he has ever been in a lifeboat or not, according to the bill. Those are the principal points of the bill as it stands now.

The resolution was unanimously carried and sent by wire to the Committee on Merchant Marine of the house of representatives.

Isherwood System of Ship Construction

The Isherwood system still continues to make rapid progress and the number of vessels contracted for on this system to date now totals to 276, representing almost a million and a quarter gross register tons. The number of vessels built during 1913 shows a considerable advance over 1912. During 1912 52 vessels of 234,615 tons were built, and during 1913 79 vessels of 384,372 gross tons were built.

Included in this number are vessels of all types and descriptions, and apart from ordinary ocean-going vessels, it is perhaps of special interest to note that three other large ore-carrying vessels have been completed for service on the Great Lakes of America. In the development of the oil tanker, the system has played a prominent part, no fewer than 39 of this class of vessel having been launched this year. The San Fraterno, the 15,000 tons d. w. tanker built on the Isherwood system, probably created more interest than any other vessel built in the current year, and is the first of 12 similar steamers building on this system, other four of which have now been launched. At the present moment about 85 per cent of the total oil tank tonnage building throughout the world is on the Isherwood system, and up to date 103 vessels of this type are already built on or are being built on this system.

Vessels have been constructed to the highest classification of Lloyds Register, British Corporation, Bureau Veritas, Germanischer Lloyd, Norske Veritas, and American Bureau, and the system has been adopted by the governments of Great Britain, United States of America and Italy.

THE BRITISH SHIP GLENESSLIN, ASHORE OFF NEAHKAHNIE MOUNTAIN, OREGON. ONE OF THE MOST REMARKABLE PHOTOGRAPHS EVER TAKEN

A Remarkable Wreck

This remarkable photograph, one of the most unique ever taken, shows the wreck of the British ship Glenesslin, shortly after she went ashore off Neahkahnie mountain on the Oregon shore a short distance south of the mouth of the Columbia river. The vessel went ashore during the middle of a clear afternoon, the wreck, as the investigation proved, being due to gross negligence on the part of the officers. The vessel ran into the rocky shore at the base of a high mountain with practically all sails set as the picture shows. Had the weather been rough it is likely that all the crew would have been lost, but they had little difficulty in rigging up a breeches buoy from the rigging to shore and thus getting off in safety. The wreck of the vessel has been sold for $560 and there is no possibility of getting her off as the coast is very rough and the facilities for salving property limited.

The Glenesslin was a representative of the once fine fleet owned by Chas. E. deWolf & Co., of Liverpool. But one more, the Engelhorn, remains of this fleet. The Glenesslin was a steel vessel of 1,645 tons net, built in 1885 at Liverpool. She had some splendid sailing records to her credit.

Wireless Stations

Another important step has been taken by the Marconi company in connection with its scheme to complete a round-the-world chain of wireless stations. A contract has been awarded for the erection of Asiatic aerials in the Sandwich Islands, to enable the station now under construction there to communicate with installations in the Phillipines, thence to Hong Kong. The range of these stations varies from 4,000 to 6,000 miles, and they are the most powerful ever built. Other installations are being located at Belmar, N. J., and Bolimas, Cal., and in Wales and Norway. Contracts were also signed recently for establishments on a different system at Shanghai, Pekin, Canton, Swatow, Hankow, Pratas Islands, Singapore and Penang. Then, again, one of the greatest radio stations in the world is to be constructed for the United States government at Caimito, in the Panama canal zone. It will be able to communicate with San Francisco, and reach into southern seas as far as Valdivia, Chile, about 420 miles south of Valparaiso, and to Buenos Ayres on the east.

The Maritime Association of the Port of New York has sent out invitations for its tenth annual dinner to be held at the Waldorf-Astoria, Saturday evening, Jan. 31. Speakers and guests of international prominence are expected as well as a large attendance of those engaged in advancing the maritime interests of the port of New York.

The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., is making additions to its machine shops and foundry, rebuilding power house, and has added a new acetylene plant. The company also contemplates building a new copper shop and new store rooms.

The board of commissioners of the Port of New Orleans has employed Marwick, Mitchell, Peet & Co. to make a survey of the situation and to recommend proper mechanical devices for handling freight on the docks.

Some Surprising Figures

Comparison of Earnings of a Steam Ship and a Krupp-Diesel Motor-Driven Ship

By John L. Bogert*

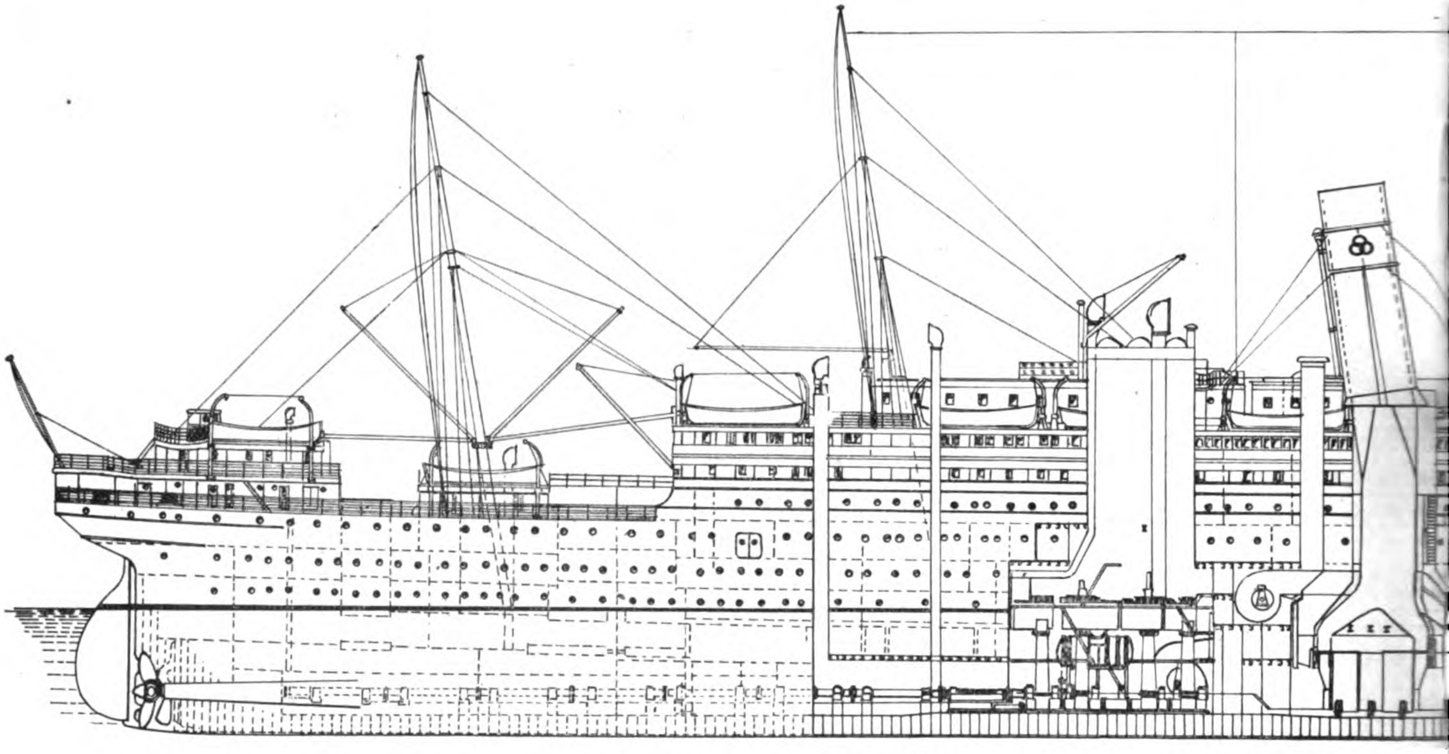
ALTHOUGH the benefits to be enjoyed by substituting Diesel engines for the best types of modern steam engines are very real in comparatively small vessels, those same benefits become more and more pronounced as the size of the ship increases. To make this plain to those interested, the following complete plans of two ships of the largest size, exactly alike as to dimensions, displacement, speed and engine power and differing only in the respect that one is a steamship, while the other is a Diesel-engine-driven motor ship, have been prepared and are shown herewith. To begin, the general particulars of these two ships are as follows: Length, 722 ft. 5 in.; breadth, 78 ft.; draught, when loaded, 33 ft.; displacement, 36,000 tons; shaft horsepower, 20,000; twin screws; sea speed, 19 knots.

The foregoing particulars are common to both ships, but here the similarity ceases. In the case of the steamship the engine and boiler compartments taken together extend for a length of 315 ft. and occupy 702,768 cu. ft., while in the case of the Diesel-engine-driven motor ship the engine compartment is but 167 ft. long and occupies but 430,843 cu. ft. The difference between the size of these two machinery compartments is 271,925 cu. ft., and because each 35 cu. ft. of this space is considered to be a ton for freight earning purposes, it is very evident that if we divide the difference between these two machinery spaces by 35, we get the amount of extra freight room that the motor ship can utilize for increased freight earnings. This comes to 271,925 cu. ft. ÷ 35 equals 7,700 tons. The steamship, however, must carry its coal in bunkers and these bunkers must have a capacity of 44 to 45 cu. ft. for each long ton of coal carried. This coal bunker space must all be above the boiler room floor plates and hence is space that might otherwise be used to stow cargo. The oil ship carries her oil in tanks, which are a part of her double bottom, so she uses up no part of her cargo space to stow her fuel. So the capacity of this steamship's bunkers, designed to hold sufficient coal for 18 days of 24 hours each, continuous steaming at 19 knots must be at least 255,200 cu. ft. and this last figure divided by 35 gives 7,300 tons of valuable cargo space that in the coal-fired steamer is given up to its fuel. This latter amount must be added to the 7,700 previously obtained and we get 15,000 tons as the amount of additional freight room in measurement tons, which the Diesel-engine-driven motor ship can make use of in earning extra freight money. If the voyage were from New York to Hamburg and back again, the freight might total $11 per ton for the round voyage. That means the handsome sum of $165,000 earned by the motor ship over and above what could possibly be earned by her rival, the steamship. If these two vessels are on a route where there is plenty of measurement freight all the year round, then by the end of the year the Diesel-engined motor ship has earned in freight money $1,980,000 more than her rival, assuming 12 round trips possible per year.

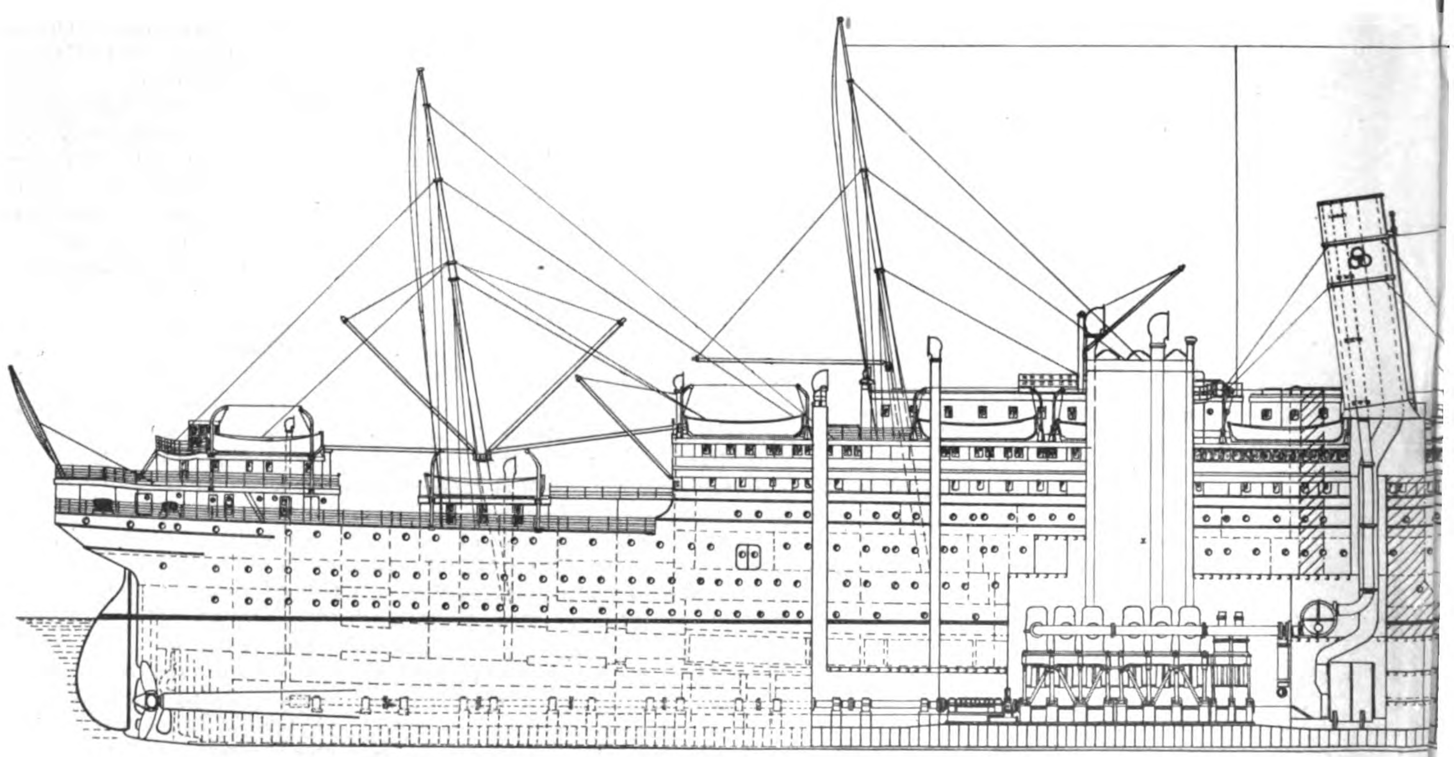
Expense of Crews

We come now to expense of the crews that are needed to man these two vessels. Because they are supposed to be alike in every other respect, we need not consider any of their crew except those required to tend their machinery. The steamship carries 180 men in the engine room, boiler room and bunkers; the motor ship carries but forty men in her engine room, so that the wages and food of 140 persons is saved every month. This might easily amount to $7,000 a month calculated as $35 a month wages and $15 a month food for each man. For twelve months this comes to $84,000 and must be added to the $1,980,000 of increased annual freight earnings previously calculated. The difference in the cost of fuel used is not so easily determined because within a year a motor ship left New York harbor with her double bottom full with 1,000 tons of high grade fuel oil that cost her owners but 2¾ cents per gal., or $8.25 a ton, and another motor ship sailed from Norfolk for Europe with oil that cost her 5 cents per gal., or $15 per ton. Lest this great variation in price should be considered peculiar to oil, it is well to bear in mind that there are many ports in different parts of the world where coal, and that, too, of an inferior quality, is only to be purchased for $10 a ton and upward, while good coal in the bunkers of a ship may cost as little as $3.50 a ton and does not usually exceed in price $4 a ton bunkered in any port on the Atlantic coast. The motor ships of the East Asiatic Co., of Copenhagen, which trade between Europe and the far east, use a distillate obtained in Borneo that costs them $7.50 per ton and carry enough of this cheap oil in their double bottoms to make it unnecessary to purchase fuel oil in any port in Europe. Tar-oil, a by-product of coke ovens and gas works, is purchaseable in Europe and also in this country for about 3¾ cents a gal., or, because its specific gravity is about equal to that of water, for about $10 per ton. It is likely that in the years that are to come this same tar oil will prevent an unjustifiable rise in the price of petroleum distillate. It is not at all unlikely that good fuel oil, meaning an oil of 18,000 B. T. U. free from sulphur, will before long gradually settle to a price of say $10 per ton in the port of New York, while equally good coal sells at $4 per ton. Taking these figures as a basis of comparison the steamship will burn 4,950 tons of this coal at $4 per ton, or $19,800 worth of coal per round trip New York to Hamburg and the Diesel-engined motor ship will consume 1,320 tons of fuel oil at $10 per ton, or $13,200 worth of oil per same round trip. The difference, $6,600 in favor of the motor ship, will amount to $79,200 per year, assuming 12 trips per year. Hence on a route of 3,500 knots where measurement freight rates are in force based on 35 cu. ft. to the ton, and where those rates average $11 per ton for the round trip the possible saving of such a Diesel-engined motor ship as we are illustrating over a strictly first-class steamship of the same size might be expressed in increased freight earnings and decreased operating expenses as $2,143,200. Lest these figures of possible increased earnings should appear too startlingly large to seem creditable, it may be well to point out that a ton of measurement as employed by the German trans-Atlantic liners is 1 cu. meter, which is equal to 35.315 cu. ft. Neglecting the decimal, this is very exactly the volume of one ton of sea water, so that 15,000 tons by measurement of increased cargo carrying space is also 15,000 tons out of

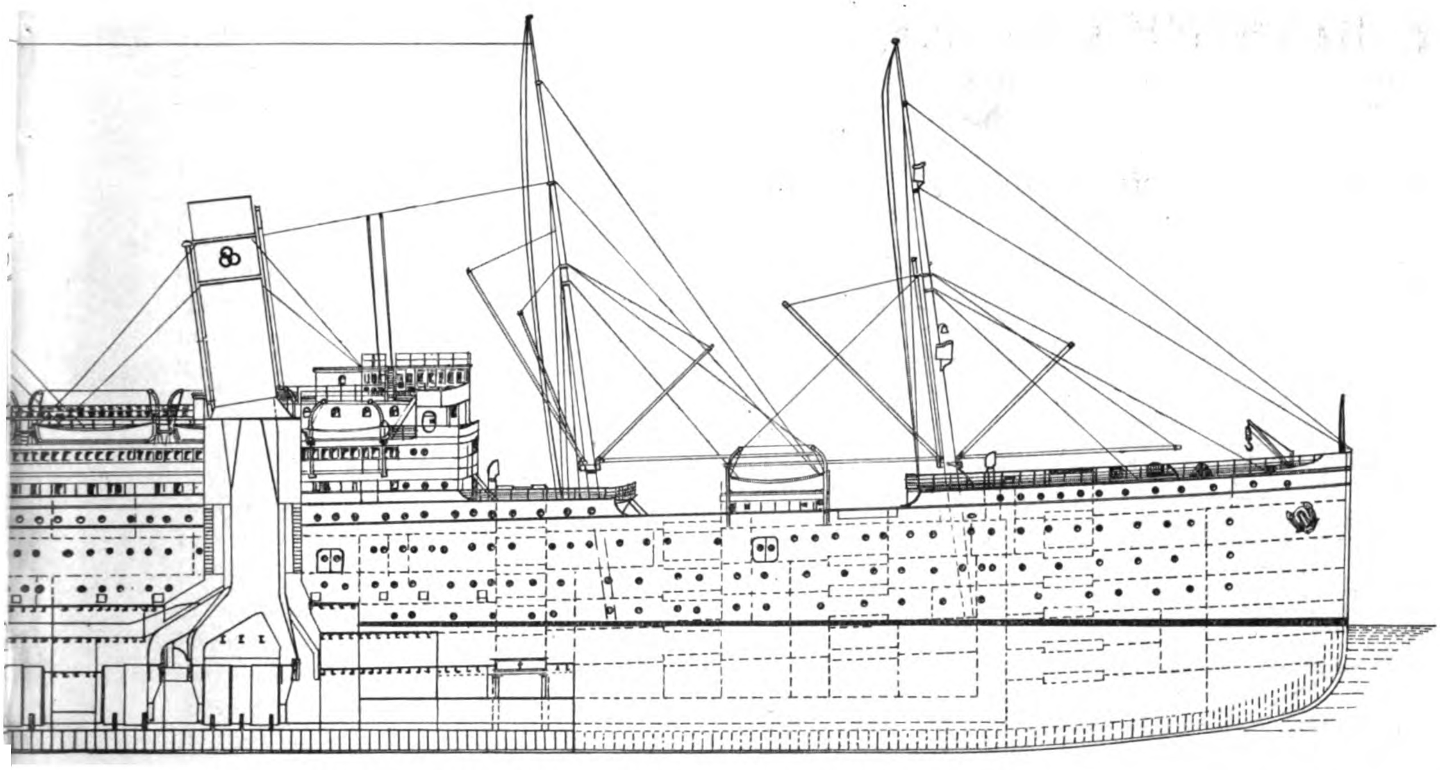
*Engineer American Krupp-System Diesel Engine Co.



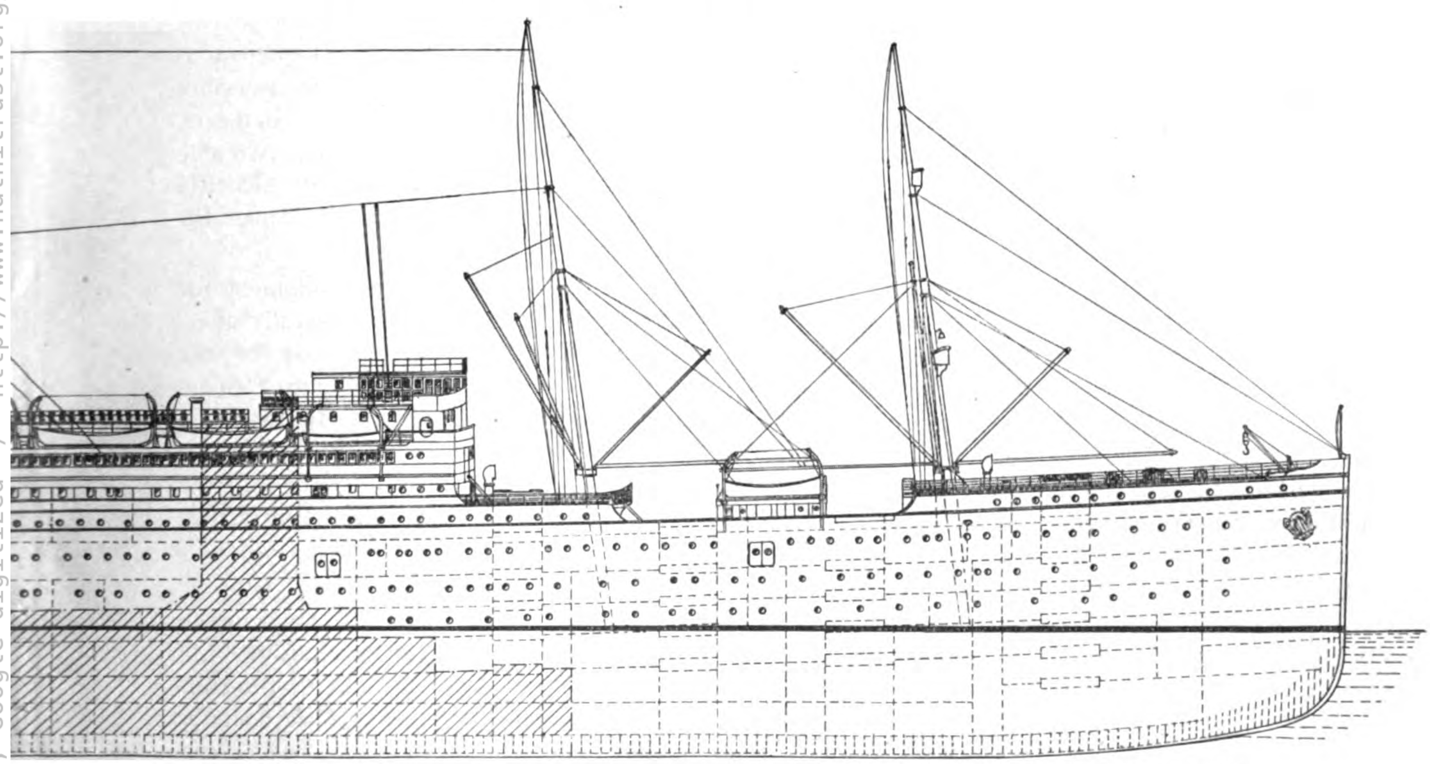
the displacement of these two ships—36,000 tons. The Diesel-engined ship carries her fuel in her double bottom and so takes no space for such purpose that might otherwise be profitably employed in the transport of freight. It is the custom of steamship lines to classify merchandise in a way to bring in the largest amount of freight money possible. That is, all bulky, light merchandise is classified for tonnage by its cubic measurement and all compact, heavy merchandise by its weight. Let us see how these two ships compare when their freight earnings are based on deadweight cargoes. The difference in weight of machinery is 4,100 tons, the weight of the entire steam installation, less 3,400 tons, the weight of the complete Diesel-engine installation. That comes to 700 tons. The weight of coal carried by the steamship is 5,800 tons and the weight of fuel oil carried in the double bottom of the Diesel-engined ship 1,540 tons. Their difference is 4,260 tons. The sum of 700 tons difference in weight of machinery added to 4,260 tons difference in weight of fuel carried is 4,960 tons; 4,960 tons



COMPARATIVE DIAGRAMS OF A STEAM SHIP AND A KRUPP-DIESEL MOTOR-DRIVEN SHIP OF SIMILAR



at $11 per ton equals $54,560, and this multiplied by 12 equals $654,720 for the year. Add to this $654,720, $84,000 saving in wages and food and $79,200 saving in cost of fuel and we get $817,720, which represents the annual advantage of the Diesel-engined motor ship over the steamship of this size. It is at once apparent how much more money can be saved in trades or routes where bulky, light freights are the rule, and heavy, compact freights the exception, but no matter what the trade or route, the Diesel-engined motor ship of this size is a much more profitable vessel than the steamship of the same dimensions. For the purposes of the foregoing calculations the steam engines are supposed to be economical enough to develop an I. H. P. hour on 1.35 lbs. of good steam coal. This is equivalent to about 1.5 lbs. per shaft horsepower hour. Likewise the assumption as to fuel consumption in the case of the Diesel engines is 4/10 of a lb. of oil per shaft horsepower hour. Both assumptions are permissible only in the case of first-class machinery installations.



DIMENSIONS, SHOWING THE RELATIVELY GREATER CARGO CARRYING SPACE OF THE MOTOR-DRIVEN SHIP

THE MARINE REVIEW

DEVOTED TO MARINE ENGINEERING, SHIP BUILDING AND ALLIED INDUSTRIES

Published Monthly by

The Penton Publishing Company

Penton Building, Cleveland.

BOSTON	Room 510, 201 Devonshire St.
CHICAGO	1521-23 Lutton Bldg.
CINCINNATI	503 Mercantile Library Bldg.
NEW YORK	503-4 West Street Bldg.
PITTSBURGH	2148-49 Oliver Bldg.
WASHINGTON, D. C.	501 Metropolitan Bank Bldg.
BIRMINGHAM, ENG.	Prince Chamber.

Subscription, $2 delivered free anywhere in the world.
Single copies, 20 cents. Back numbers over three months, 50 cents.

Change of advertising copy must reach this office on or before the first of each month.

The Cleveland News Co. will supply the trade with THE MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

January, 1914

La Follette Seamen's Bill

At the recent meeting of the Society of Naval Architects and Marine Engineers, in New York City, Lewis Nixon offered a resolution protesting against the so-called La Follette seamen's bill, declaring that it threatens the very existence of ship building in the United States and would end the flying of the American flag on the high seas. The text of the resolution follows:

"On Oct. 3, 1913, the United States senate passed Senate Bill 136.

"This bill is alleged to promote the welfare of American seamen in the merchant marine of the United States.

"This society does not concur in the view that a law which makes it impossible to fly the American flag on the oceans in the foreign trade is in the interests of seamen of the country. It believes that legislation which will hinder the expansion of our coasting fleets and nullify much of the good that will result from the development of our deeper waterways is against the welfare of any of our people.

"It is our judgment that as the result of the enactment of this bill American vessels will be driven from the foreign commerce upon the Pacific, that trade will be driven to Canadian ports and that vast damage will be done to our transportation systems on land and sea.

"It believes that on account of the demoralization resulting from the false and misleading impressions to be created by such bill as to the relation between the seamen and the officers of our merchant vessels, the hazard of the sea will be greatly added to and that the safety of persons and conditions in transit at sea will be threatened.

"The bill is vicious selective class legislation based upon misrepresentation, and which defeats the very object that it is alleged to further.

"Therefore, Be It Resolved, That the Society of Naval Architects and Marine Engineers, representing the ship building and allied interests of the United States, protests against the enactment of Senate Bill 136, as operating against the upbuilding of our merchant marine, reducing the opportunity of employment of American seamen, adding to the risk of life and property at sea and sapping the commercial independence of the nation.,

"That a copy of this resolution be sent to the committee having cognizance of merchant marine legislation in the senate and house, and to the secretary of commerce."

Certainly no body of men is more competent to pass upon such a measure than the Society of Naval Architects and Marine Engineers, whose whole existence is dealing with the problems of the sea. Stevenson Taylor emphatically declared that the measure if passed would destroy not only all attempts at improvement in our ocean service, but would absolutely destroy many of the lines engaged in sound, bay, river and lake service. There is absolutely no sense to the measure and it is surprising that the bill should have passed the senate. The provision providing that each life boat should be manned by two able seamen is perfectly absurd. There are no longer any able bodied seamen aboard ship. The men now employed on the deck of a steamer are largely engaged in polishing brass and chipping off rust spots. They are simply deck hands and may not be as competent to handle a life boat as men employed in other parts of the ship. Under modern conditions of ship operation, the life boat crews are drafted from every department, including engineers, firemen, oilers and stewards. To require that two able seamen should also be added to the crew of each life boat would mean the carrying of two extra men for this purpose.

It is all very well to carry life boat equipment for all in deep sea sailing. No one can successfully quarrel with that demand considering the case of the Titanic, yet nevertheless it was only the exceptional circumstances surrounding this great tragedy that made it possible for the life boats to be successfully launched and to live after they were launched. The case of the Volturno demonstrated very conclusively the utter uselessness of life boats under the ordinary conditions prevailing in the North Atlantic.

But when it comes to sounds, bays, rivers and inland lakes, it is a perfectly preposterous proposition that life boats should be carried for all. On many of the runs the boats would be better off without any life boats at all and on the lakes the ships could be beached or run into sheltered water long before one-tenth of their

life boat equipment could be launched, provided that they had to carry life boats for everyone aboard.

It is understood that this measure is to come before the committee on merchant marine of the house of representatives during the present month, and that Andrew Furuseth, who inspired the measure, is to appear before the committee in its defense. Furuseth was one of the American delegates to the International Conference on Safety at Sea, in London, and resigned because he could not get the conference to endorse his absurd notions. For 19 years Furuseth has been a habitual attendant of the senate gallery and is as well acquainted with present conditions at sea as anyone else would be who spent 19 continuous years in the senate gallery.

Lake Trade

The year 1914 certainly opens with an entirely different outlook than that which confronted 1913 as far as the great lakes are concerned. At this time last year ore shippers had practically disposed of all the ore that they could promise to deliver and had practically covered their requirements in vessel tonnage. No program has as yet been arranged for 1914 and probably will not be for some time. There has been noted during the past month a steady improvement in industrial conditions which it must be admitted were at the close of navigation in a thoroughly depressed state. Stimulated by low prices, buying has been quite active of late and the hope is entertained that by spring the market may assume a normal state.

There is consolation in the fact that as far as the vessel owners are concerned the year 1913 leaves little to be desired. A combination of circumstances contributed to make it quite profitable for the vessel owner. It had been quite clearly demonstrated during 1912 that even the most modern carriers operating exclusively in the ore trade could scarcely break even at 40 cents net, and the rate was accordingly advanced 5 cents. The coal rate to Lake Michigan ports was advanced from 30 to 35 cents, being a restoration of a rate that had prevailed for many years. In addition to this stages of water were unusually favorable, so that a modern vessel carried several hundred tons more per trip than last year. Dispatch also was excellent, very little time being spent in port. The average detention at loading and unloading ports in actual hours was two more in 1912, but it must be borne in mind that they carried more cargo per trip.

The movement of both coal and ore was the heaviest on record, while the grain movement exceeded that of 1912, which was almost more than double that of any preceding year. The grain rates, however, did not work out quite as well as the 1912 rate, which is not saying, however, that they were not quite profitable to the ship. The highest rate paid during 1913 was 3½ cents, whereas some grain was moved in 1912 at 5 cents. However, the ships were busy from start to finish and everyone enjoyed a good season. The vessels also had the advantage of a slightly lower rate for insurance. It looked as though the vessel owners and underwriters would enjoy a season of almost total freedom from serious accident, and up to November casualties were few and unimportant. Fate ordained, however, that in the second week of November the lakes should be visited by a storm the like of which had never before been experienced. There are apparently certain forces in the elements that ships are not designed to withstand. The monsoons of the Chinese sea take down many a craft that is built to withstand gales of measured violence, but occasionally there springs up a storm of such incredible energy that the vessels are fairly shaken to pieces. Such must have been the character of the great storm on Lake Huron, on Nov. 9, when eight vessels foundered. It was unprecedented and unforeseen, one of the awful visitations of nature which humble us all.

Forward

The opening of the year 1914 is in striking contrast to the opening of the year 1913. No year in the country's history began with the impetus that 1913 did and no year has equaled it in material accomplishments. It began with pig iron enjoying an ascending market and furnace interests so eager for ore that they had practically purchased 45,000,000 tons before the year began. It closed with pig iron at the lowest point in several years and with no demand for ore for 1914 requirements. The slump in the iron business in December was very precipitate, the furnaces turning out 1,000,000 tons less than in December, 1912. However, let no one think that this is anything more than a temporary let-up. The country has just stopped for breath. Already there are certain little signs to be noted of a quickening in trade and before navigation begins the market may again have reached a normal stage. There is no such thing as pessimism in the United States. This country is going to get along splendidly. The present decline can doubtless be traced to perfectly natural causes. The uncertainties produced by tariff legislation is undoubtedly one of them; the currency bill may be another, and the fact that the railways have not been liberal buyers has certainly had an influence. These conditions, however, cure themselves, and in a little while we will have got again into the usual stride. The law of supply and demand, supreme to all legislation, is the law that after all governs. The natural tendency of this law is to operate in favor of the United States. This country is a growing one and is an enormous consumer. The output of one year is not sufficient for the next and if there should be over-production of any commodity at the present moment, it will be very rapidly digested. The march must be irresistibly onward. He who believes otherwise will be left behind.

Signal Recording Apparatus

Chart Productions of Graphic Signal and Engine Movement Recording Apparatus on Steamer George F. Brownell

THE REVIEW herewith presents reproductions of a section of each chart from the graphic signal and engine movement recording apparatus on the steamer George F. Brownell, of the Erie Railroad Lake Line, as promised in the October issue, in which the first public reference to the apparatus was made.

The charts show graphically the movement of the ship from the Erie dock at Washington street to the Santa Fe dock at Twenty-seventh and Robey streets, in the south branch of the Chicago river and were selected because of the constant maneuvering required in the swift current of the south branch. It will be noticed at once that the engines were being worked principally on backing signals and the time intervals are very short. The chart speed is 6 in. per hour, the ordinate spacing representing 7½ minute intervals. Some of the signals are less than fifteen seconds apart, yet the engine response is clearly indicated not only as to direction but also as to speed. The latter is readily determined by the abscissae spacing, each space representing five revolutions. Not a response is missing. It will be at once apparent that, first, the signal actually given is recorded and, second, the action actually taken in the engine room is similarly recorded, the graphs moving side by side at the same speed and operated by the same clock mechanism.

Devices exist which indicate visually to the officer on the bridge what the engines are doing but so far nothing has been done to establish what was done on the bridge or to make a synchronous graphic record of either the signals given or the action which followed. Hence frequent disputes as to "mistakes in signals".

The numerals in the margin have been added merely for convenience in comparison and do not appear on the charts. The time spacing is not shown, since, as previously intimated, the apparatus has been under observation only, though continuously, and the speed and consequently time spacing, had not been finally determined when the charts were laid out.

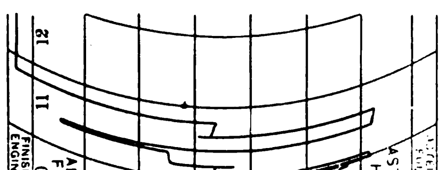
The overrunning of the pen at the shift of signals is due to the momentum of the pen itself, the shift being instantaneous, but does not affect the clarity of the record. Similarly the wavy appearance of the engine record is due to the extreme sensitiveness of the pen which is affected by any vibration of the ship. In the case shown the ship was light and the tremor usually observable under such conditions is quite apparent. The record, however, is not in any way affected thereby.

Several interesting features will be discovered upon an examination of the charts.

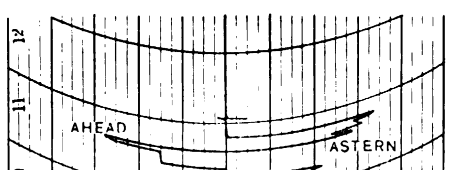
Beginning with 1, the first signal is "ahead slow", then "stop", then "astern half", "stop", "astern slow", "stop", "astern slow", "ahead slow", "stop", "astern slow", "stop", and in 5, "astern slow", followed almost at once by "astern half" then back to "astern slow", and within a few seconds to "ahead slow". The action of the engines is perfectly clear both as to direction and speed. Similarly in 11 is shown "astern slow" followed shortly by "astern half", and then "ahead slow" increased to "ahead half", swinging clear across to "astern half", the last working signal being "stop", followed by "finished with engines". The total time covered by this section is 93 minutes and records 51 signals given and answered, an average of one every 1.8 minutes. The longest interval between signals is 6 minutes, the shortest about 10 seconds.

The length of interval, however, or even the exact instant at which a signal is given, are relatively unimportant compared with direction and speed, and since ahead and astern working and signals are shown on widely separated portions of the chart, agreement or disagreement is apparent instantly and on the most casual inspection.

The apparatus is not considered to be a preventive of, but a means of fixing responsibility for, disaster,



TELEGRAPH SIGNAL RECORD READ UP



ENGINE SPEED AND DIRECTION RECORD. READ UP

though it furnishes also a pen picture of the handling of the ship and a continuous graphic record of performance under way, showing not only the interpretation of signals in the engine room as to speeds, but the promptness with which they are answered and even momentary variations in speed under way.

For instance, one chart showed a stoppage of engines in midlake without any shift of telegraph, bringing out the fact that the engines were stopped to secure an oil pipe which had worked loose, although not noted in the log, and started ahead again without notice to or from the bridge. It also brings out variations in steam pressure and the consequent change in engine speeds, not apparent in the regular log without comparison of hourly counter reading and checking of averages.

The Brownell passed through the terrible gale of Nov. 10 on Lake Huron and the engine record chart of that date brings out engine room conditions more clearly than any description. Although a high-powered ship, on two occasions it was found impossible to keep her head to sea at the permissible engine speeds. The chart shows the beginning of influence of sea on engine speeds at about Point Aux Barques, and from then on gradual increase in racing and the enormous range in the efforts to bring her back head to sea at which times the speeds varied almost instantaneously from 15 to 95 revolutions per minute. As these engines are 54-in. stroke, the piston speed varied from 135 to 855 ft. per minute.

There is no mechanical connection whatever between the different parts of the apparatus, even the operating current for the two recording pens being derived from different sources.

A visual speed and direction indicator operated by current from the same source as the engine recording pen is fitted under the eye of the master merely to show him what is going on below but is not considered an essential, or even valuable, feature.

THE REVIEW believes it to be a subject for regret that its inventor announces that there is no present intention to offer the apparatus for general use. It was developed as a matter of interest only and to demonstrate a belief arising out of several instances of extensive damage attributed to mistakes in signals, in some of which the signal actually given and the responsibility for the damage incurred was open to serious doubt.

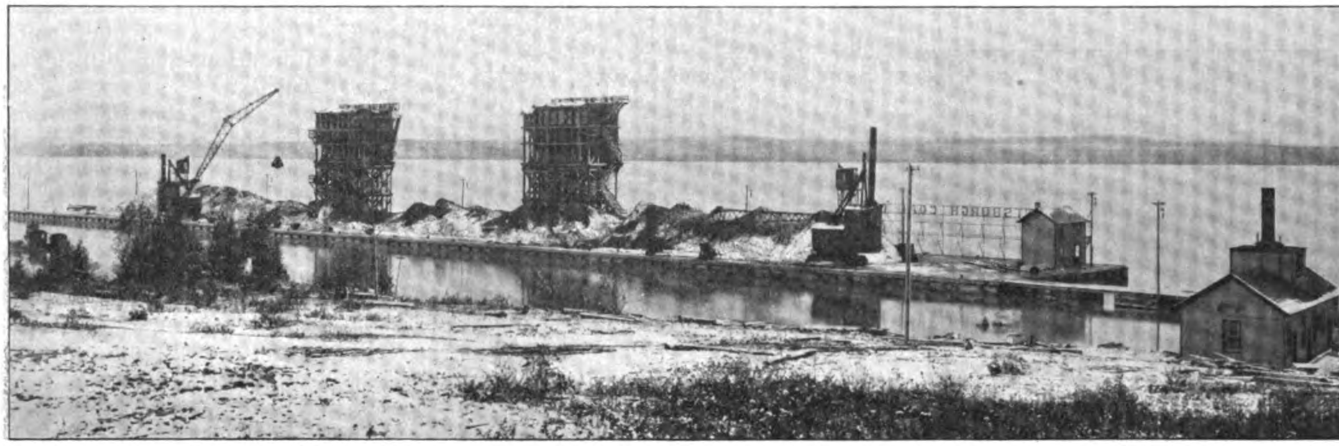
Its description, for which we are indebted to H. Penton, of Babcock & Penton, engineers and naval architects, New York and Cleveland, is offered as he says "merely to illustrate the results obtained in an effort to work out an interesting and always present problem". That it has been solved we think will be agreed.

Lime Island Fuel Dock

The Pittsburgh Coal Co.'s new Lime Island fuel dock was put in operation in September last. The results achieved fully warrant the statement that it is the fastest fuel handling plant on the Great Lakes, as by actual test, the largest steamers have received their fuel supply at this dock in the space of five minutes.

The location of the dock is ideal for its purpose, as it is situated but 1,000 ft. off the main channel, and steamers bound in either direction can reach the dock without rounding to. On account of the natural protection afforded by Lime Island, and the narrowness of the channel, vessels are able to reach the dock in all kinds of weather. The cargoes of coal are discharged at the rear of the dock, thus leaving the front always open for the delivery of fuel. There are 24 ft. of water in front of the dock.

This fuel dock is of crib construction, 100 ft. wide, and 800 ft. long, and has a storage capacity of 20,000 tons, while the fuel pockets hold 800 tons, thus insuring a full supply of fuel at all times. The dock has its own power plant, and is lighted by electricity; it is of solid and massive construction, the cribs being solidly filled with rock.



THE NEW FUELING DOCK OF THE PITTSBURGH COAL CO. AT LIME ISLAND, ST. MARY'S RIVER

Canada Steamship Line

The board of directors of the Canada Steamship Lines announce the election of the following officers:

James Carruthers, president, Montreal; William Wainwright, vice president, Montreal; M. J. Haney, vice president, Toronto; J. P. Steedman, vice president, Hamilton; J. W. Norcross, managing director, Montreal; C. A. Barnard, K. C., general counsel, Montreal; F. Percy Smith, assistant to president and secretary, Montreal; F. S. Isard, comptroller, Montreal; J. I. Hobson, treasurer, Montreal.

J. W. Norcross, managing director, announces the following appointments, effective Jan. 1, 1914:

W. E. Burke, assistant manager, Montreal; H. Foster Chaffee, passenger traffic manager, Montreal; L. A. W. Doherty, freight traffic manager, Montreal; Gilbert Johnston, mechanical superintendent passenger steamers, Montreal; Thos. Henry, operating superintendent passenger steamers, Montreal; Peter Paton, assistant operating superintendent passenger steamers, Toronto; H. W. Cowan, operating superintendent freight steamers, Toronto; J. J. Phelan, purchasing agent, Montreal; R. Duguid, superintendent engineer, Toronto; W. H. Featherstonaugh, superintendent of hulls, Toronto.

Collier Hampden

The New York Ship Building Co., Camden, N. J., is now building for the Coastwise Transportation Co., Boston, Mass., a steel screw collier, of the following dimensions:

Length between perpendiculars, 377 ft., 4 in.; beam, molded, 50 ft.; depth, molded, 32 ft.; draught, loaded, 25 ft.; gross tonnage, 4,727 tons; speed at sea, loaded, 10 knots.

The vessel is of the same type as the Coastwise, Transportation, Suffolk, Norfolk, and Middlesex, built by

LAUNCHING COLLIER HAMPDEN AT CAMDEN

the New York Shipbuilding Co. for the same owners during the last four years, the dimensions and deadweight, however, having been increased. The construction is in accordance with the requirements of Lloyds Register.

The vessel has a single deck of steel, with poop 80 ft., bridge 17 ft., and forecastle 34 ft. long, eight steel watertight bulkheads, two pole masts, straight stem and semi-elliptical stern. A deep double bottom is fitted all fore and aft for the carriage of water ballast, and particular attention has been paid to the construction of this part of the vessel; the plating being of extra strength and fitted flush; no wood ceiling is fitted. Water ballast is also carried in a deep tank amidships. The five cargo holds are entirely clear of beams and pillars, the deck being supported by deep arched beams and web frames fitted midway between the watertight bulkheads; a continuous trunk 24 in. deep by 30 ft. wide is carried on the upper deck for the full length of the cargo spaces, the sides forming strength girders between the bulkheads. Large steel cargo hatches are fitted in top of this trunk, eleven in all, three to main hold and two to each of the other holds. Six steam winches are fitted in connection with six pairs of king posts for raising the hatch covers and securing them in place when open. A cargo boom is fitted on the foremast for handling stores, etc. The coal bunkers are at the sides of the vessel in the boiler room and in the poop 'tween decks, with hatches on the poop deck and pockets leading to the fireroom. The peaks are both fitted as water ballast tanks. The accommodations consist of a midship deckhouse on the bridge deck for the captain's state room and spare room, with a pilot house over; the saloon, officers' and petty officers' berths, pantry, toilet, etc., are in the bridge; the engineers, cooks, steward, mess room, refrigerator, toilets, galley, etc., are in the house on the poop deck, and the oilers, seamen and firemen are berthed in the poop abreast the engine casing.

A steam windlass is fitted forward with the wildcats and warping ends on the forecastle deck and the engine below in the forecastle. A steam capstan is fitted on the after end of the poop deck, with the engine below. The steam steering gear is fitted on the upper deck abaft the engine casing with connection to the steering station in pilot house and on navigating bridge; an auxiliary hand screw gear being fitted to the crosshead on the rudder stock on the upper deck.

The propelling machinery is placed aft, and consists of one triple-expansion inverted reciprocating engine of about 2,100 I. H. P., and two single-ended Scotch boilers have a working pressure of 185 lbs.

The vessel is intended for the coastwise coal carrying trade. Loading and discharging gear is not fitted on board; the two terminal points being arranged with these facilities.

The sponsor was Mrs. J. G. Crowley, of Boston, wife of the general manager and treasurer of the Coastwise Transportation Co., Boston, Mass.

Fire Island Light Vessel No. 68

Fire Island Light-Vessel No. 68, constructed by the Bath Iron Works. Bath, Me., in 1897, was placed upon station Sept. 20, 1897, and is of the following general dimensions: Length between perpendiculars, 112 ft.; breadth molded, 28 ft. 6 in.; depth of hull to spar deck, 22 ft. 1½ in.; load draught, 12 ft. 6 in.; corresponding displacement, 624½ tons.

The vessel is of partial composite construction consisting of a steel frame, steel keel plate, steel bilgestrake, and steel top sides, connected by diagonal steel plates to the keel, and wood-planked from the keel to the top side plating in way of the main deck. The vessel is self-propelling and steam plant consists of a vertical, inverted, surface condensing single cylinder engine, capable of developing 350 I. H. P., one three-furnace Scotch type boiler, 12 ft. 2 in. diameter by 11 ft. 3 in. long, and the usual auxiliaries. Two upright donkey boilers, 4 ft. 6 in. in diameter by 9 ft. high, are also installed.

The electric plant consists of an installation in duplicate of General Electric marine type dynamos directly connected to double-cylinder, 4¼ x 4-in. steam engines. The dynamos are compound wound and have a capacity of 16 k. w. and voltage of 100. They supply current not only for the illumination of the interior of the ship, but also for the signal lights at each of the two mast heads, which give a characteristic of two fixed white lights for the vessel. Each group of these mast headlights consists of three 300-mm. lens, lanterns suspended in gimbals and fitted with one 200-C. P. incandescent lamp each, and the light from each group of lanterns ranges from 6,400 C. P. minimum to 9,600 C. P. maximum.

The fog signal consists of a 12-in. chime whistle, operating by steam. The characteristic of the signal consists of a group of two three-second blasts every 30 seconds and is obtained by duplicate sets of the Crosby automatic mechanism. The hull of the vessel is painted red with the name "Fire Island" in white letters on each side.

New Steamer for Pelee Island Service

The Collingwood Shipbuilding Co., Collingwood, Ont., launched on Saturday afternoon, Dec. 20, 1913, a handsomely modelled passenger and package freight steamer intended for the service of The Windsor & Pelee Island Steam Navigation Co.

The general dimensions of the vessel are: 146 ft. long by 24 ft. beam by 18 ft. 3 in. molded depth to promenade deck, and she has been specially designed to handle passenger and package freight between Pelee Island, Lake Erie and Windsor and other ports.

The propelling machinery consists of a set of triple expansion jet condensing engines supplied with steam from one Scotch marine boiler, and

the whole is designed to give the vessel a speed of about thirteen miles per hour when loaded. The vessel will be delivered to the owners at the opening of navigation, 1914. The vessel has been built to the designs and under the supervision of Hugh Calderwood, of Barrie.

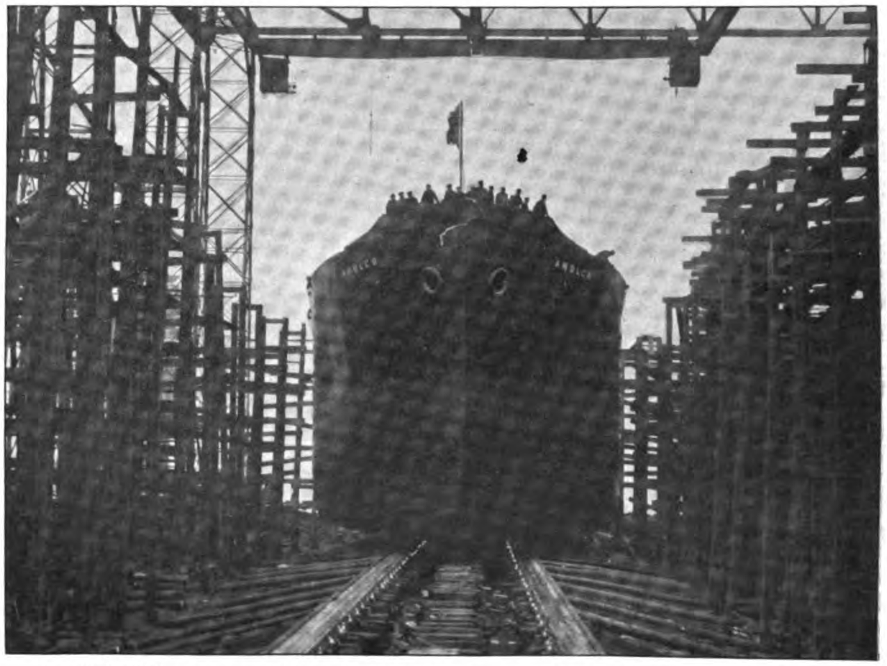
Molasses Steamer Amolco

The steamer Amolco, recently launched by the Fore River Shipbuilding Corporation, Quincy, Mass., for the Boston Molasses Co., is a single-screw steamer, with machinery aft, constructed of steel to the highest class in Lloyds Registry, being specially surveyed by that society to obtain the class 100 AL, and designed to operate in either the molasses or bulk petroleum and general cargo and sugar trade.

The principal dimensions are as follows: Length over all, 325 ft. 6 in.; length between perpendiculars, 318 ft. 6 in.; beam, molded, 46 ft.; depth, molded to upper deck, 25 ft. 6 in.; depth, molded to second deck, 17 ft. 6 in.; load draught, 20 ft.

The hold is divided into five double tanks with a general cargo space forward and aft of same, the latter being separated from the former by cofferdams extending the full depth of ship. The spaces on the second deck at sides and forward and aft of expansion trunk are also used for carrying general cargo, these and the holds being operated through large hatches fitted with wood covers and the usual tarpaulins and battening arrangements. The tanks are fitted with oil-tight hatches and may be utilized for the transportation of molasses or bulk petroleum, a special pumping system having been installed for loading and discharging liquid cargo, also a steam-heating system for liquefying cargo as well as to efficiently clean all spaces of steam.

The total capacity for stowing molasses is 800,000 gals. and the capacity of the coal bunkers about 500 tons. A double bottom is fitted under coal bunker and machinery spaces and divided into two tanks, the one under the coal bunker and boiler room being used for reserve feed water and one under the engine room for ballast. The pumping system for handling liquid cargo has been especially designed for pumping heavy viscous liquids, such as molasses or oil. The cargo pumps, two in number, are of the Blake horizontal duplex type, with steam cylinders, 16 in. in diameter, pump cylinders, 10 in. diameter, with 18 in. stroke. A 10-in. suction main of wrought iron extends through the cargo holds on the starboard side above the floors, with 8-in. suction branches extending into each tank, each branch being fitted with a steel gate valve and bell mouth suction end. An 8-in. discharge main of wrought iron extends through the holds above floor, port side, with branches leading to each tank, and to overboard discharge connections forward and aft. The entire system is so arranged that the cargo pumps can pump from the cargo tanks and discharge overboard from barge direct to the cargo tanks, from any one cargo tank to any other and from sea to any cargo tank for ballast purposes. The tanks may also be filled through the discharge main. Steam coils are fitted around the suction bell mouth in each hold, so that heavy oil cargo may be partially heated in order that it may run more readily to the pumps.



LAUNCHING MOLASSES STEAMER AMOLCO AT THE FORE RIVER YARD

The propelling machinery, located in the stern of the ship, consists of a vertical inverted three-cylinder, triple-expansion engine with cylinders 22 in., 37 in. and 60 in. diameter, having a stroke of 42 in., supplied with steam at 180 lbs. pressure by two single-ended Scotch boilers working under a heated forced draft system.

The boilers are 13 ft. 6 in. diameter and 10 ft. 10 in. long, arranged in a single stoke hold. Each boiler has three Morison furnaces, 42 in. inside diameter, and three combustion chambers. The tubes are 2½ in. outside diameter. The total heating surface for two boilers is 4,000 sq. ft., with 100 sq. ft. of grate, giving a ratio of 40 to 1. Air for heated forced draft is delivered to the furnaces by a fan located in the fire room and driven by a 6-in. x 6-in. vertical engine. On each uptake there is a heater box, around which the air passes before entering the furnaces.

The refrigerating plant consists of a one-ton ammonia direct expansion type outfit, motor-driven. One ash hoist engine of the Hyde make, 4½ in. by 4½ in., double-cylinder, is located in the stoke hold.

Barges for Panama

Two of the six 1,000 cu. yd. steel dump barges, for the manufacture and delivery of which by Jan. 1, 1914, contract was let by the Isthmian Canal Commission to the Maryland Steel Co., arrived at Colon on Dec. 18, having left the yard of the builders at Sparrows Point, Md., on Dec. 2, in tow of the Merrick & Chapman Wrecking Co.'s tug Rescue. On Dec. 19 they were passed through Gatun locks and towed to Culebra cut. These barges are designed for service with two 15-cu. yd. dipper dredges now under construction and have just twice the capacity of the largest barges previously in the canal service.

D. J. Hanlon & Co., Alameda, Cal., recently leased about five acres of land on the Oakland water front from the City of Oakland, Cal., for a term of fifteen years and has begun to install large dry dock machinery, etc., thereon.

Sealed proposals for construction of the two motor dredge tenders Perry and Skycoak will be received at the office of Lieut. Col. Eveleth Winslow, Room 2, Customhouse, Norfolk, Va., until 12 o'clock, Feb. 12, 1914, and then publicly opened.

Lake Erie Ore Receipts

Figures compiled by THE MARINE REVIEW from the returns sent in by the various dock companies show that iron ore receipts at Lake Erie ports during the season of 1913 were 39,099,647 tons, out of a total movement of ore by lake of 49,070,478 tons. Lake Erie docks on Dec. 1 held a balance of 9,261,676 tons, the smallest amount in five years.

During 1912 the total shipment by lake was 47,435,777 tons, of which Lake Erie docks received 37,472,108 tons, and held a balance on Dec. 1, 1912, of 10,080,798 tons. During 1911 the total shipment by lake was 32,130,411, of which Lake Erie docks received 25,531,550 tons and held a balance on Dec. 1, 1911, of 9,469,869 tons.

During 1910 the total shipment by lake was 42,620,201 tons, of which Lake Erie docks received 34,042,897 tons and held a balance on Dec. 1, 1910, of 9,797,980 tons. During 1909 the total shipment by lake was 41,683,873 tons, of which Lake Erie docks received 33,672,825 tons and held a balance on Dec. 1, 1909, of 9,471,428 tons. The reserve of 9,261,676 tons is more than will be needed for winter consumption. Never in the history of the trade have 5,000,000 tons gone forward from dock to furnace during the winter season.

Shipments to furnaces between May 1 and Dec. 1, 1913, aggregate 35,747,800 tons, compared with 33,421,251 tons in 1912, compared with 23,011,274 tons in 1911, 29,724,938 tons in 1910, 30,030,559 tons in 1909, 17,254,782 tons in 1908.

The shipments to furnaces during the season of navigation, as referred to, are determined in this way: First, we have the amount of ore on Lake Erie docks as of May 1 last, 5,909,829 tons; add to this the receipts of the season just closed, 39,099,647 tons, and the total is 45,009,476 tons; deduct the amount on dock Dec. 1, 9,261,676 tons, and we have 35,747,800 tons as the amount that was forwarded either direct or from dock to furnace yards.

It is understood, of course, that the difference between the total output of 49,070,478 tons which was shipped from the Lake Superior mines during 1913 and the receipts of 39,099,647 tons at Lake Erie ports, is ore that went to places other than Lake Erie ports, such as furnaces at Lake Michigan ports. The amount of ore on dock May 1, 1913, as given above, does not include April receipts, which amounted to 262,047 tons. The accompanying table shows receipts at Lake Erie ports and amounts on dock during the six years past.

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS.

	1913.	1912.	1911.	1910.	1909.	1908.
Toledo	1,084,215	1,411,278	493,345	1,225,202	1,374,224	680,553
Sandusky	....	....	....	....	11,088	....
Huron	687,485	540,586	223,947	197,951	243,082	213,377
Lorain	3,709,213	3,771,350	2,937,605	2,884,738	2,796,856	2,286,388
Cleveland	8,812,583	7,914,836	4,584,211	6,344,943	6,051,342	4,240,815
Fairport	2,037,126	1,810,381	666,365	1,516,434	1,734,277	1,518,961
Ashtabula	8,336,126	8,158,080	6,359,131	9,620,638	8,056,941	3,012,064
Conneaut	7,849,303	7,839,831	6,931,278	6,309,548	7,007,834	4,798,631
Erie	713,904	547,067	289,400	942,592	1,235,057	828,602
Buffalo	5,506,691	5,060,642	2,802,976	4,704,439	5,002,235	2,835,099
Detroit	363,001	418,057	243,292	296,412	159,889	....
Total	39,099,647	37,472,108	25,531,550	34,042,897	33,672,825	20,414,491

IRON ORE ON LAKE ERIE DOCKS, DEC. 1, GROSS TONS.

	1913.	1912.	1911.	1910.	1909.	1908.
Toledo	349,047	549,473	661,382	433,215	332,456	590,925
Sandusky	2,472	2,472	2,471	17,728	39,557	36,079
Huron	441,541	385,810	344,371	375,118	477,333	458,158
Lorain	694,704	904,343	652,526	630,547	912,768	1,508,744
Cleveland	1,930,720	1,888,560	1,589,491	1,638,795	1,547,142	1,458,392
Fairport	478,014	565,920	636,566	839,970	867,640	835,821
Ashtabula	3,202,807	3,350,553	3,295,862	3,287,816	2,594,359	2,295,531
Conneaut	1,248,032	1,429,533	1,237,573	1,329,997	1,411,002	1,296,675
Erie	594,613	661,330	636,274	792,011	788,046	730,530
Buffalo	319,726	340,261	413,353	452,783	501,125	315,148
Total	9,261,676	10,080,798	9,469,869	9,797,980	9,471,428	9,074,003

Lake Michigan Ore Receipts

Lake Michigan is growing in importance annually as an ore receiving lake. During 1910 Lake Michigan ports received a total of 7,452,084 gross tons. During 1911, which was a year of lessened movement generally, Lake Michigan received 5,558,458 tons. During 1912 it received 8,357,070 tons. During 1913 it received 8,701,732 tons, distributed as follows:

Port.	Season 1913, gross tons.
South Chicago, Ill.	5,572,866
Indiana Harbor, Ind.	455,252
Milwaukee, Wis.	234,591
Gary, Ind.	2,365,551
East Jordan, Mich.	28,444
Boyne City, Mich.	45,028
Total	8,701,732

Lake Ore Shipments

Lake ore shipments during 1913 were 49,070,478 gross tons, being an increase of 1,634,701 tons over the movement of 1912. The ore movement from September on during 1913 was less than the movement for the corresponding months of 1912, but the heavy summer movement more than offset the loss. Following is the summary of the November movement and the season's movement with corresponding data for 1912:

Port.	November, 1912. gross tons.	November, 1913. gross tons.
Escanaba	560,328	*485,102
Marquette	214,431	194,720
Ashland	414,224	281,476
Superior	1,140,767	941,520
Duluth	1,080,066	810,973
Two Harbors	662,858	569,319
	4,072,674	3,283,110
1913 decrease	....	789,564

*Includes two December cargoes, totaling 18,545 tons.

Port.	Season 1912. gross tons.	Season 1913. gross tons.
Escanaba	5,234,655	5,399,444
Marquette	3,296,761	3,137,617
Ashland	4,797,101	4,338,230
Superior	14,240,714	13,788,343
Duluth	10,495,577	12,331,126
Two Harbors	9,370,969	10,075,718
	47,435,777	49,070,478
1913 increase	....	1,634,701

Personal

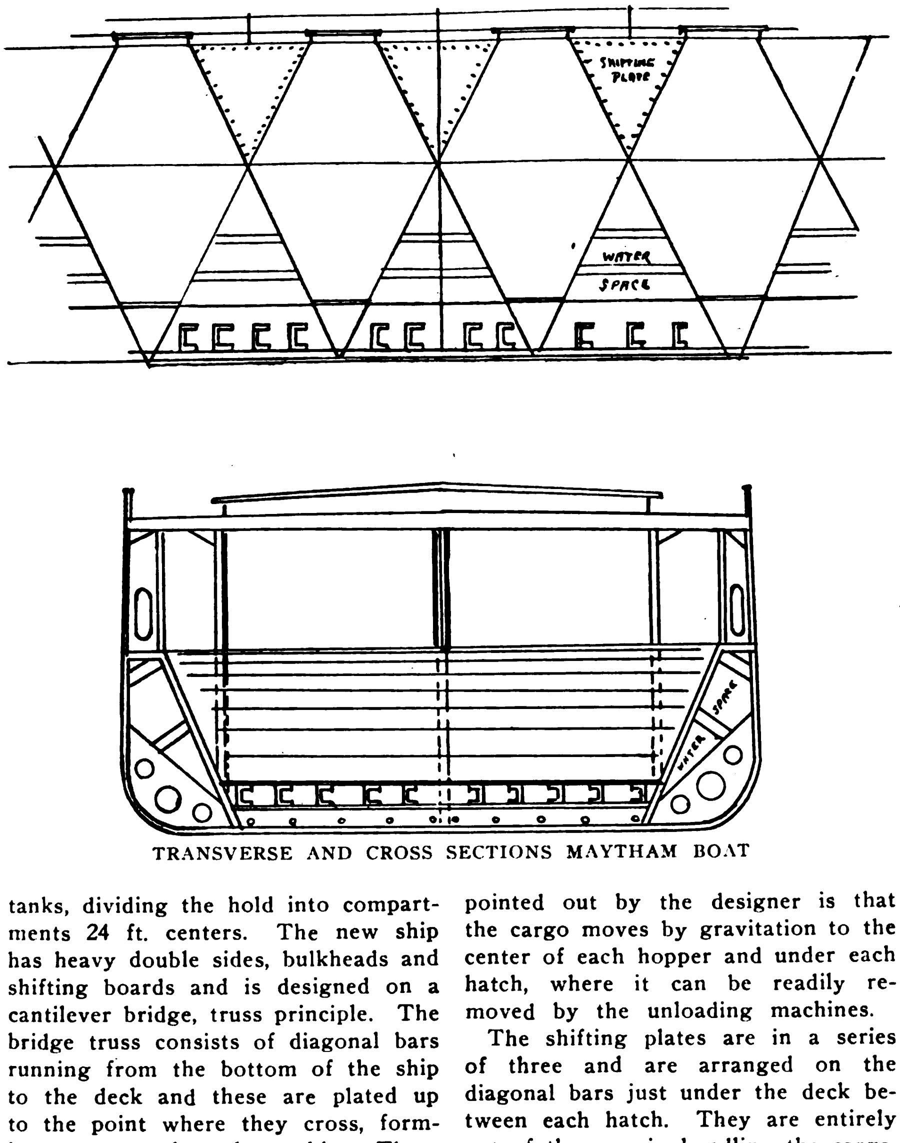
James French, who for several years past has been Lloyds principal surveyor for the United States, sailed for England on Dec. 16 to assume charge of the Glasgow office which, next to the London office, is the principal department of Lloyds. As a recognition of his services to the society in the United States, he was presented with a solid silver tea and coffee service by Lloyds, as well as a purse of 500 guineas. At a dinner given in his honor just before sailing, J. W. Isherwood presented him with a solid silver tray to match the service, and friends whom he met during his stay in the United States gave him a loving cup 24 in. high and 12 in. in diameter. Spontaneous offerings such as these are prompted by personality only. In addition to being an extremely able man, Mr. French has very human qualities and a highly magnetic nature.

The annual meeting of the Lake Carriers' Association will be held at the Cadillac Hotel, Detroit, on Jan. 22, and that of the Great Lakes Protective Association on Jan. 23.

New Design of Bulk Freighter

G. W. Maytham, of Buffalo, who has been all his life identified with lake trade, has designed a new type of bulk freighter and has organized the Automatic Transfer Co. to market the design. As will be seen from the transverse and cross sections published herewith, the vessel has both athwartship and longitudinal water tanks, dividing the hold into compartments 24 ft. centers. The new ship has heavy double sides, bulkheads and shifting boards and is designed on a cantilever bridge, truss principle. The bridge truss consists of diagonal bars running from the bottom of the ship to the deck and these are plated up to the point where they cross, forming water tanks athwartship. There are also bars running from the bottom of the ship to a point well above the load water line on either side, and as they are plated they form longitudinal water tanks, practically giving the ship a double hull. The designer represents that it is impossible for the vessel to either collapse in the sides or to break in two. Should the ship come into collision with another vessel, it is improbable that the inner skin would be damaged and that even if it were, only one compartment would be damaged. As the water tanks are in the sides and athwartship instead of running along the bottom as in the ordinary type, the ship can be trimmed to a proper seaworthy depth when going light or loaded and the ends kept down to make her manageable.

The material required for this type of construction is very little more, if any, than that used in constructing an open tank and she will carry as much cargo as any vessel of equal weight of material. An important feature pointed out by the designer is that the cargo moves by gravitation to the center of each hopper and under each hatch, where it can be readily removed by the unloading machines.



TRANSVERSE AND CROSS SECTIONS MAYTHAM BOAT

The shifting plates are in a series of three and are arranged on the diagonal bars just under the deck between each hatch. They are entirely out of the way in handling the cargo, extending to the apex of the hopper, absolutely preventing shifting of cargo. Further particulars of the design will be furnished to anyone interested by Mr. Maytham.

Locating Sunken Vessels

Editor Marine Review: — I have been much interested in reading your account of the recent disasters on the Great Lakes. There seems to be no practical means of preventing great loss of life and property when "Mother Nature" does the unusual thing. Ships are designed for and life saving appliances are made for the usual stresses of bad weather, but when the unusual occurs, like collision with other ships or icebergs, especially combined with blinding snow storms, the ordinary vessel is found sadly wanting.

It would be possible to build compartment vessels that could outride any of our recorded hurricanes, or to still remain afloat with her bottom pierced, but it would not be practical from a financial point of view, as the ordinary type of vessel could transport cargo so much cheaper, and, fortunately, such severe storms as those of Nov. 8 to 11 seldom occur; therefore, shipowners and sailors will continue to take their chances on the sinkable vessels, so it is part of their training to accept the consequences of Nature in her unusual mood.

The writer has spent a number of years in the design and construction of sinkable ships, viz., submarine vessels, and my experiments with this class of vessel has led me to design apparatus for rapidly and systematically searching the sea bottom in locating sunken ships and recovering them and their cargoes.

In 1900 I spent several months in searching for vessels in Long Island sound, and located 16 vessels, the names of only two of which were known, and recovered the cargo from many of them; some of them had evidently been down a great many years, two of them were entirely covered with mud and silt. Most of the cargoes were coal, one was copper ore and matte, and one was flour and hides, with a deck load of scrap iron; this vessel was buried to her rail in mud, and had been sunk for at least 35 years, as the firm who had made the leather had been out of business for that length of time. The vessel was found in 75 ft. of water. Strange to say, the flour was still dry in the center, as the water had formed a paste, which prevented the water, even at a pressure of over 30 lbs. per square inch, from penetrating to the center of the barrel, leaving a dry core. With my apparatus I could cover about 20 square miles a day in searching the bottom.

I had intended pushing this apparatus, and also my various inventions for floating sunken vessels and recovering their cargoes, but I have been so tied up with government contracts for my submarine boats that I have not had the time to give to it. Would any one on the lakes be interested in this enterprise?

Simon Lake.

Bridgeport, Conn.

The Brude Lifeboat

Captain Ole Brude, the inventor of the Brude life boat, which successfully made a trip across the Atlantic from Norway to the United States a few years ago, is now in Cleveland endeavoring to interest lake vessel owners in his life boat.

This life boat is already installed on

BRUDE LIFEBOAT

one lake vessel, the car ferry Ashtabula, of the Pennsylvania-Ontario Transportation Co.'s fleet. The Brude boat is unlike any other life boat in that it is entirely covered over, as will be seen in the accompanying photograph. It is practically non-capsizable and nonsinkable. Its double bottom is divided into four watertight compartments or ballast tanks, and its tank capacity under the seats make it impossible to capsize. As its passengers are entirely inside the boat, they are protected from cold. The buoyancy of the boat is such that it cannot be drawn down by suction, and as it has a very stout wooden fender completely encircling it, it can stand severe punishment by being thrown against the ship's side in launching. A Brude boat 18 ft. long, 8 ft. wide and 8 ft. high can give seating accommodation inside the boat for about 44 persons. In other words, one of these boats would be more than ample for an ordinary lake freighter. The Brude boat is fitted with a sail and can be navigated in all sorts of weather.

Atlantic Transport Liner Missouri

The Atlantic transport liner Missouri was recently launched from Harland & Wolff's yard, Glasgow. The Missouri is 383 ft. 9 in. in length over all and 50 ft. 4 in. extreme beam, with a gross tonnage of about 5,000. The new vessel, which has been built to the survey of the board of trade, has a double bottom constructed on the cellular principle, and the watertight bulkheads extend to the upper deck. There are five steel decks and the scantlings are in accordance with the builders' usual practice, so that the structure is a very strong one.

The Missouri is intended to carry a large cargo and is provided with the latest and most improved facilities for working ship and cargo. The derrick tables on each mast are arranged to take six derricks each, for working Nos. 1 and 2 hatches forward and 4 and 5 hatches aft. There are two derrick posts forward, one on the port side and one on starboard side, with two derricks on each for working Nos. 2 and 3 hatches, making 16 derricks in all, each lifting five tons. There are four 7 in. by 12 in. double purchase winches arranged between Nos. 1 and 2 hatches, and four between Nos. 4 and 5 hatches; also two double purchase winches 7 in. x 12 in., arranged one at each derrick post forward. The warping winch is 8 in. by 14 in., double purchase, placed on the shelter deck aft, and the steam windlass is arranged on this deck forward for working cables 2 3/16 in. diameter. The steering gear is of Harland & Wolff's type, cylinders 8 in. by 8 in. by 8 in., quadrant 5 ft. 9 in. radius. The steering engine is situated in a steel house aft on upper deck and controlled by a telemotor from the navigating bridge.

The vessel has good accommodation for captain, officers and crew, and a complete installation of electric light; also wireless telegraphy and submarine signalling apparatus.

The Missouri will be towed to Belfast shortly after the launch to receive her machinery, which is being constructed in Harland & Wolff's engine works there, where the vessel will be completed ready for sea.

During construction the vessel has been under the supervision of Captain Tubb, marine superintendent, and B. P. Fielden, superintendent engineer of the Atlantic Transport Line.

SUMMARY OF NAVAL CONSTRUCTION

		Per cent of completion. Dec. 1, 1913.		Nov. 1, 1913.	
Name of Vessel.	Contractor.	Total.	Per cent on ship.	Total.	Per cent on ship.
	BATTLESHIPS				
New York	New York Navy Yard	94.0	93.3	92.0	91.1
Texas	Newport News Ship Building Co.	97.2	96.6	96.0	95.4
Nevada	Fore River Ship Building Co.	50.8	32.8	49.2	30.4
Oklahoma	New York Ship Building Co.	51.6	46.9	48.7	42.7
Pennsylvania	Newport News Ship Building Co.	14.1	8.6	11.8	5.6
———	New York Navy Yard	1.4	....	....	....
	DESTROYERS				
Downes	New York Ship Building Co.	87.2	87.2	81.7	81.0
Aylwin	Wm. Cramp & Sons	97.4	97.4	97.4	97.4
Parker	Wm. Cramp & Sons	95.2	95.2	95.2	95.0
Benham	Wm. Cramp & Sons	93.0	92.8	93.0	92.8
Balch	Wm. Cramp & Sons	92.6	92.4	92.6	92.4
O'Brien	Wm. Cramp & Sons	20.1	13.0	14.9	7.5
Nicholson	Wm. Cramp & Sons	19.1	11.8	13.6	6.0
Winslow	Wm. Cramp & Sons	18.0	10.8	14.2	7.0
McDougal	Bath Iron Works	45.4	40.3	34.3	27.9
Cushing	Fore River Ship Building Co.	24.0	17.8	21.3	14.8
Ericsson	New York Ship Building Co.	25.2	21.5	15.1	7.1
———	Fore River Ship Building Co.	....	....	....	....
———	Wm. Cramp & Sons	....	....	....	....
———	Wm. Cramp & Sons	....	....	....	....
———	Bath Iron Works	....	....	....	....
———	New York Ship Building Co.	....	....	....	....
———	New York Ship Building Co.	....	....	....	....
	DESTROYER TENDERS.				
Melville	New York Ship Building Co.	15.3	6.0	10.0	....
	SUBMARINES				
G-4	American Laurenti Co. (Phila.)	96.4	95.5	96.4	95.5
G-2	Lake Tow Boat Co. (Bridgeport)	89.7	89.7	89.7	89.7
H-1	Electric Boat Co. (San Francisco)	100.0	100.0	97.9	97.9
H-2	Electric Boat Co. (San Francisco)	100.0	100.0	97.9	97.9
H-3	Electric Boat Co. (Seattle)	98.9	98.0	98.0	97.9
G-3	Lake Tow Boat Co. (Bridgeport)	77.3	77.0	74.2	73.9
K-1	Electric Boat Co. (Quincy)	94.1	94.1	94.0	94.0
K-2	Electric Boat Co. (Quincy)	94.1	94.1	91.8	91.8
K-3	Electric Boat Co. (San Francisco)	89.5	88.8	88.6	87.8
K-4	Electric Boat Co. (Seattle)	88.4	86.0	88.0	86.0
K-5	Electric Boat Co. (Quincy)	83.9	82.3	79.3	76.9
K-6	Electric Boat Co. (Quincy)	83.4	81.8	78.3	75.8
K-7	Electric Boat Co. (San Francisco)	80.9	79.2	78.5	76.6
K-8	Electric Boat Co. (San Francisco)	78.5	76.8	76.4	74.5
L-1	Electric Boat Co. (Quincy)	16.2	12.0	13.0	9.2
L-2	Electric Boat Co. (Quincy)	16.2	12.0	13.0	9.2
L-3	Electric Boat Co. (Quincy)	16.2	12.0	13.0	9.2
L-4	Electric Boat Co. (Quincy)	16.2	12.0	13.0	9.2
L-5	Lake Tow Boat Co. (Bridgeport)	7.4	4.2	7.4	4.2
L-6	Lake Tow Boat Co. (Long Beach, Cal.)	....	....	....	....
L-7	Lake Tow Boat Co. (Long Beach, Cal.)	....	....	....	....
M-1	Electric Boat Co. (Quincy)	11.1	7.5	9.7	6.4
	SUBMARINE TENDERS				
Fulton	New London S. & E. B. Co. (Quincy)	27.8	19.1	23.4	13.7
Bushnell	Seattle Construction & Dry Dock Co.	4.5	....	3.0	....
	FUEL SHIPS				
Kanawha	Mare Island Navy Yard	14.7	9.1	9.4	2.6
Maumee	Mare Island Navy Yard	9.2	...	5.3	...
	GUN BOATS				
Sacramento	Wm. Cramp & Sons	57.3	55.1	54.4	51.1
Monocacy	Mare Island Navy Yard	100.0	100.0	99.0	99.0
Palos	Mare Island Navy Yard	....	....	100.0	100.0

Lake Vessel Losses

The Year Would Not Have Been a Severe One Had it Not Been for the Great November Storm

VESSEL losses during 1913 totaled 31, of which 22 were steamers, seven barges, one tug and one lightship. Foundering caused 16 losses, strandings eight, collisions three, pounding by the seas two, fire one, and boiler explosion one. Were it not for the frightful cyclone which struck Lake Huron on Sunday, Nov. 9, and which is dealt with elsewhere in this report, losses would have been unimportant and the lives lost would have been only nine, but the frightful havoc caused by that one storm has made the property loss heavy and the death toll the largest in lake history.

The first steamer to be totally lost was the Uganda, which was cut through by the ice in the Straits of Mackinac, on April 18, and foundered. The barge Iron City was struck by the steamer Thomas F. Cole in St. Clair river, near Russell Island, on May 3, and was practically cut in two. The barge Allegheny ran ashore in a heavy storm at Crisp Point, Lake Superior, on June 6, and became a total loss. The steamer E. M. Peck was destroyed by the explosion of her starboard boiler at Racine, on June 11, becoming a constructive total loss. Seven members of the crew were killed. The barge Annabell Wilson foundered in Lake Erie off Dunkirk, on July 12, drowning two members of the crew. The barge Crete was in collision with the steamer F. B. Squire in the St. Clair ship canal and was sunk on Aug. 7, becoming a constructive total loss. The barge Donaldson filled with water and sank in the outer harbor at Cleveland on Aug. 17. The steamer City of London, which was sunk in collision with the steamer J. S. Morrow off Point Pelee, Lake Erie, on Sept. 30, was a total loss. The steamer C. C. Hand caught fire in Green Bay on Oct. 7 and was totally destroyed. The steamer C. W. Elphicke sprang a leak in Lake Erie on Oct. 21 and was beached at Long Point, where she broke in two. The barge Parsons foundered in Lake Ontario with a cargo of coal on Nov. 24. The steamer I. W. Nicholas stranded on North Point, Lake Huron, on Nov. 26 and was abandoned as a constructive total loss. The tug James H. Martin sank at Menominee, Mich., on Nov. 30.

The other vessels included in the accompanying table of total losses were caught in the great storm, which swept the lakes on Nov. 8 to 11 and, as stated, the account of that disaster is chronicled elsewhere in this report.

As heretofore related, were it not for this great storm the loss of life on the lakes during 1913 would have been only nine; as it is, they are 253. During 1912 the loss of life was 33 as against 51 for 1911, 49 for 1910 and 121 for 1909.

TOTAL LOSSES OF LAKE VESSELS

Name of Vessel.	Cause.	Where Lost.	Carrying capacity, gross tons.
Str. Uganda	Foundered	Straits of Mackinac	2,900
Bge. Iron City	Collision	St. Clair River	615
Bge. Allegheny	Ran ashore	Crisp Point, Lake Superior	630
*Str. E. M. Peck	Boiler explosion	Racine, Wis.	3,000
*Bge. Crete	Collision	St. Clair Ship Canal	3,406
Bge. Donaldson	Foundered	Outer Harbor, Cleveland	800
Str. Chas. S. Price	Foundered	Lake Huron	9,000
Str. Isaac M. Scott	Foundered	Lake Huron	9,000
Str. H. B. Smith	Foundered	Lake Superior	10,000
Str. James Carruthers	Foundered	Lake Huron	9,500
Str. Wexford	Foundered	Lake Huron	2,800
Str. Regina	Foundered	Lake Huron	3,000
Str. Leafield	Foundered	Angus Island, Lake Superior	3,500
Str. John A. McGean	Foundered	Lake Huron	7,500
Str. Argus	Foundered	Lake Huron	7,000
Str. Hydrus	Foundered	Lake Huron	7,000
Bge. Plymouth	Foundered	Gull Island, Lake Michigan	600
Lightship No. 82	Foundered	Point Abino, Lake Erie	.....
Bge. Halsted	Driven ashore	Green Bay, Lake Michigan	800
*Str. L. C. Waldo	Ran ashore	Manitou Island, Lake Superior	7,000
*Str. H. M. Hanna Jr.	Ran ashore	Pt. Aux Barques, Lake Huron	8,500
*Str. Major	Pounded in storm	Lake Superior	3,000
*Str. Matoa	Ran ashore	Pt. Aux Barques, Lake Huron	3,104
*Louisiana	Ran ashore and burned	Washington Island, Lake Michigan	2,800
Turret Chief	Ran ashore	Copper Harbor, Lake Superior	3,100
Str. C. C. Hand	Fire	Green Bay	2,800
Str. C. W. Elphicke	Wrecked in storm	Lake Erie	3,100
Str. City of London	Collision	Off Point Pelee, Lake Erie	2,950
Bge. Parsons	Foundered	Off Oswego, Lake Ontario	500
*Str. I. W. Nicholas	Grounded	Off North Point, Lake Huron	3,859
Tug James H. Martin	Foundered	Menominee, Mich.	.....

*Constructive total losses.

CHRONOLOGICAL LIST OF VESSEL ACCIDENTS

Date.	Name of Vessel.	Nature of Accident.	Location.
Sep. 17	Str. G. G. Barnum	Struck a boulder; hole punched in starboard bow; repaired at Superior	Lake Erie, near Sandusky.
Sep. 18	Str. Brilliant	Collided with Str. Canadian while leaving port; two plates damaged	Lorain, O.
Sep. 18	Str. Canadian	Collided with Str. Brilliant while leaving port; stern twisted, ten plates stove in, and hawse pipe broken; temporarily repaired at Lorain; later to be repaired at Port Arthur; damage estimated at $5,000	Lorain, O.
Sep. 18	Str. Henry Steinbrenner	Ran aground owing to low water; released on Sept. 19	Bar Point, Detroit river.
Sep. ..	Str. Collingwood	Hit pier of American canal; went to Port Arthur to be examined.	Sault Ste. Marie, Mich.
Sep. ..	Str. Arabian	Ran ashore; docked at Kingston on Sept. 19	Lachine Lake.
Sep. 19	Str. Agawa	Ore dredge of Algoma Steel Co. collapsed and fell on steamer. Number of plates damaged; temporarily repaired; to be repaired at Collingwood at end of season	Sault Ste. Marie, Ont.
Sep. 19	Str. Colgate	Struck and damaged her steering gear; repaired at Ecorse	Livingstone Channel.
Sep. 19	Str. Haddington	Ran ashore on rock bottom in storm; released on Sept. 25 after lightering several hundred tons of coal; arrived at Cleveland on Sept. 30 to be docked; 71 plates damaged, nine of which must be replaced. About three weeks in dry dock	Near Port Colborne, Lake Erie.
Sep. ..	Str. Waccamaw	Struck; docked at Ashtabula for repairs to bottom damaged on Sept. 21	Niagara river.
Sep. 20	Str. W. P. Snyder	Ran aground; released herself, uninjured	Bar Point, Detroit river.
Sep. 22	Str. Nyanza	Blown ashore in storm on rock bottom; released on Sept. 23 after lightering 15,000 bu. corn; reloaded lightered cargo	Point Aux Barques, Lake Huron
Sep. ..	Str. Thomas Barlum	Blew out a cylinder head; ran into Houghton for temporary repairs	Lake Superior.
Sep. ..	Str. A. M. Marshall	Stopped at Cleveland on Sept. 22 for new anchor to replace one she lost	Lake Ontario.

Date.	Name of Vessel.	Nature of Accident.	Location.
Sep. ..	Str. E. N. Ohl	Arrived at Duluth on Sept. 23 with a few plates loosened as result of storm; went to Superior ship yard for repairs after unloading	
Sep. ..	Str. James P. Walsh	Lost a number of hatch covers in storm and after deck house badly damaged; stopped at Houghton for repairs	
Sep. ..	Str. Helen C.	Ran aground; released on Sept. 23	Sandusky harbor.
Sep. 24	Str. Andrew Carnegie	Damaged by fire which started on dock while she was unloading; upper works scarred	Milwaukee.
Sep. 25	Str. Griffin	Ran ashore in fog; released after lightering several hundred tons of coal; not damaged	Cedar Reef.
Sep. 25	Str. Meaford	Collided with Str. Rosemount; repaired at Collingwood	
Sep. 26	Str. Athabasca	Hit north pier and damaged her port bow; temporarily repaired	Sault Ste. Marie, Ont.
Sep. 26	Str. C. A. Congdon	Hit the breakwater and damaged her quadrant; made repairs at Fairport	Fairport, O.
Sep. 26	Str. Douglas Houghton	Collided with barge Bacon when her tow line parted; fantail broken in several places; proceeded and was repaired at Lorain, from which port she cleared on Oct. 2	Soo.
Sep. 26	Sch. Melvin S. Bacon	Collided with Str. Douglas Houghton when her tow line parted (in tow of Str. Aztec); stem broken in two and upper timbers badly broken up; temporarily repaired at Sault; arrived at Cleveland Oct. 1 pretty badly damaged and two or three weeks required for repairs	Soo.
Sep. 27	Str. John W. Gates	Ran aground on a sand bar; released, uninjured	Entrance to Conneaut harbor.
Sep. 27	Str. North Sea	Struck while entering port	Buffalo.
Sep. 28	Str. J. B. Ketchum	Collided with Str. Beaverton; stem broken	Welland canal.
Sep. 28	Str. Beaverton	Collided with Str. J. B. Ketchum; hole 18 in. diameter ripped in side and four plates damaged	Welland canal.
Sep. 29	Str. Thomas F. Cole	Hit No. 5 dock; slightly damaged	Duluth, Minn.
Sep. 29	Str. Coralia	Lost an anchor	St. Louis Bay.
Sep. 29	Str. Jas. E. Davidson	Steering gear broke and she ran aground; released on Sept. 30 after lightering 60,000 bu. grain; reloaded lightered cargo and sailed Oct. 1.	Livingstone channel.
Sep. 30	Str. City of London	Collided with Str. J. S. Morrow in heavy fog; sank in 34 ft. of water; crew escaped; cargo of wheat sold to Armour & Co., Chicago, Oct. 10	Off Point Pelee, Lake Erie.
Sep. 30	Str. J. S. Morrow	Collided with Str. City of London in heavy fog; hit on port side near No. 7 hatch, tearing large hole in her; beached, and docked at Ecorse Oct. 1; 8 plates taken off and tank top damaged. About one week in dry dock	Off Point Pelee, Lake Erie.
Sep. 30	Str. W. D. Rees	Collided with Str. Prince Rupert; hit at No. 11 hatch, filled up and was run hard ashore to prevent sinking; decks buckled; floated Oct. 5; made repairs and left on Nov. 9; docked at Toledo Oct. 15; about 60 plates damaged and interior considerably damaged; repairs estimated between $35,000 and $40,000; three weeks or more in dry dock	Vidal Shoals, St. Mary's River.
Sep. 30	Str. Prince Rupert	Collided with Str. W. D. Rees; stem twisted to port and hawse pipe broken, some plates damaged and forepeak full of water. Cement patch put on and she left Oct. 4	Vidal Shoals, St. Mary's River.
Sep. 30	Str. Joseph Wood	Grounded owing to low water; released Oct. 4	Toledo harbor.
Sep. 30	Str. Thomas Adams	Ran aground; released after lightering	Algonac, St. Clair river.
Sep. 30	Str. Western Star	Ran aground; floated, uninjured	Milwaukee harbor.
Oct. 1	Str. George Craig	Ran ashore; released after lightering 400 tons of coal	Baby's Point, St. Clair river.
Oct. 1	Str. C. W. Elphicke	Hit forward of boiler house by oil barge Calvert (in tow of tug Sarnia City) which took a sheer; considerably damaged	St. Clair river.
Oct. 2	Str. Jupiter	Threw bucket off her wheel; stopped at Reid's dry dock, Port Huron, for repairs	St. Clair river.
Oct. .	Str. City of Rome	Stopped at Port Huron Oct. 4 with disabled machinery; repaired at Port Huron	
Oct. 2	Str. D. Z. Norton	Hit by Str. Chas. A. Weston	Soo river.
Oct. 2	Str. Chas. Weston	Hit Str. Norton; slightly damaged	Soo river.
Oct. 5	Str. L. C. Waldo	Ran aground; released by tug on Oct. 6	Algonac, St. Clair river.
Oct. .	Str. Neepawah	Struck and somewhat damaged	St. Lawrence river.
Oct. 7	Str. C. C. Hand	Burned to water's edge. Crew escaped	Green bay.
Oct. 8	Str. Thomas Walters	Ran aground while turning around in fog; released, uninjured	St. Clair river.
Oct. .	Str. John Duncan	Broke her stern tube and had to be beached; pumped out and taken to Kingston for repairs	Lake Ontario.
Oct. 10	Str. Cepheus	Ran ashore in fog; released herself; docked at Ashtabula on Oct. 15 and repairs completed on Oct. 24; eight plates damaged	St. Martin's island, Green bay.
Oct. ..	Str. John Lambert	Ran hard aground; released by high wind, uninjured	Lake Ontario.
Oct. ..	Str. Jeska	Became disabled; picked up and towed to port by Str. Lambert	Near Oswego, Lake Ontario.
Oct. 14	Str. W. A. Rogers	Touched bottom of river	St. Clair river.
Oct. 15	Str. Ball Bros	Collided with Str. Arcturus; a few bow plates damaged. Arcturus not damaged	Conneaut harbor.
Oct. 15	Str. Lackawanna	Lost her rudder; arrived at Duluth on Oct. 20; new rudder installed and bottom damage repaired. Left dry dock Nov. 3	Lake Superior.
Oct. ..	Str. Eastern States	Lost her rudder; docked at Ecorse	
Oct. ..	Str. Bickerdyke	Struck; docked at Kingston	St. Lawrence river.
Oct. 16	Str. Masaba	Air pump broke; picked up by Str. Easton and towed to Kingston for repairs	Lake Huron.
Oct. 17	Str. Huron City	Grounded with cargo of lumber	Portage river.
Oct. 16	Scow	Hit by Str. Moses Taylor and sank	Cleveland.
Oct. 18	Str. L. C. Hanna	Collided with Bge. Marsala; fantail and rudder and several plates damaged; later grounded at Bar Point owing to low water; released herself; docked at Cleveland on Oct. 21 and repairs completed on Oct. 28; stern badly twisted	Lake St. Clair.
Oct. 18	Bge. Marsala	(In tow of Str. J. B. Eads). Collided with Str. L. C. Hanna. Stern slightly twisted	Lake St. Clair.
Oct. 18	Str. W. A. Paine	Ran aground owing to low water	Toledo harbor.
Oct. 18	Str. Frank C. Ball	Struck bottom while going in south entrance; forward tank shoved up; did not leak	Buffalo.
Oct. 19	Str. Norwalk	Ran on rocks, coal-laden, in heavy gale; released on Oct. 23 after lightering 500 tons and coal cargo sold to Reid's, Port Huron. Stern post open and keel from engine aft badly damaged	Near Middle island, Lake Huron
Oct. 21	Str. C. W. Elphicke	Sprang a leak in storm and was beached at Long Point; later broke in two; total loss; insured for $20,000; part of wheat cargo salved	Lake Erie.
Oct. 24	Bge. S. G. Thomas	(In tow of Str. Maunaloa). Hit by Str. Chas. S. Price amidships; six plates dented and twelve frames buckled above water line; was upbound, but turned around and came to Cleveland in tow of Str. Hill. Str. Price not damaged and proceeded	Bar Point, Detroit river.
Oct. 24	Bge. Matanzas	Ran ashore twice while entering channel, (in tow of Str. Amazonas) released after lightering 200 tons	West Neebish channel.
Oct. 25	Str. Mapleton	Collided with stone wall and punctured her bottom; docked at Lorain on Oct. 27 and repairs completed on Oct. 31	Ramey's Bend, near Port Colborne.
Oct. 26	Bge. Pennington	Collided with Str. Coralia in high wind storm; docked at Superior and received new forefoot and considerable new planking on port side; left dry dock Nov. 3. Str. Coralia slightly damaged, but proceeded	Duluth, Minn.
Oct. 28	Sand Str. R. E. Doville	Lake Shore bridge closed on steamer; badly damaged	Toledo, O.
Oct. 28	Str. Pere Marquette	Hit a fish tug and was pretty badly damaged	Ludington, Mich.
Oct. 29	Bge. J. F. Eddy	While being towed out struck the channel bank, twisting rudder stock; repaired	Duluth.

Date.—Name of Vessel.		Nature of Accident.	Location.
Oct. 29	Bge. Redington	Struck in storm by Str. Sawyer while shifting at dock; considerable damaged; repaired at Duluth	Duluth.
Oct. 29	Sand Scow Tuttle	Boiler exploded; sank in Maumee bay	Toledo, O.
Oct. 29	Str. James H. Hoyt	Ran aground but released herself; leaked slightly; docked at Ashtabula on Oct. 31	Seneca Shoal, Lake Erie.
Oct. ..	Str. L. C. Smith	In attempting to pass a steamer in outer harbor, got too close shore and stranded; released on Nov. 1 after lightering 400 tons coal	Buffalo.
Nov. 1	Str. D. R. Hanna	Broke crankshaft forward of driving bearing; towed to Lorain; about one week to make repairs	Lake St. Clair.
Nov. .	Bge. Ceylon	Ran ashore, grain-laden; assistance sent from Kingston	Long Point, Lake Ontario.
Nov. .	Str. George Markham	Picked up in disabled condition and towed to Manitowoc	Lake Michigan.
Nov. 1	Str. J. J. Albright	Collided with Bge. John Smeaton at Central furnace	Cleveland.
Nov. 2	Bge. Scotia	(In tow of Str. Arizona). Struck east channel bank abreast of Bois Blanc light; leaked and ran aground; repaired at Amherstburg, Ont.	Livingstone channel.
Nov. 2	Str. Queen City	Collided with Str. Siemens; both boats temporarily repaired at Sault; to be docked later	American canal, Sault.
Nov. 3	Str. G. W. Perkins	Lost an anchor in harbor basin	Duluth.
Nov. 4	Str. J. J. Albright	Ran aground; released on Nov. 4 after lightering; not damaged	Russel island.
Nov. 4	Str. Price McKinney	Struck; docked at Cleveland on Nov. 6; seven plates damaged	Grosse Pt. Cut.
Nov. 6	Bge. Redfern	Ran on rocks. (In tow of Str. W. H. Sawyer)	Niagara river.
Nov. 6	Str. Ogdensburg	Collided with Str. Bennington; number of plates damaged above water line	Milwaukee.
Nov. 6	Str. Bennington	Collided with Str. Ogdensburg; stern and five bow plates damaged above water line	Milwaukee.
Nov. 8	Str. H. P. Bope	Picked up one of her cables in her wheel while leaving port	Superior.
Nov. 8	Str. M. C. Elphicke	Ran aground in low water	Bar Point, Detroit river.
Nov. 8	Str. Louisiana	Ran ashore in storm, caught fire and became total loss. Insured for $15,000 against fire	Washington island, Lake Michigan.
Nov. .	Str. Farrell	Lost both anchors; returned to Sault	Gros Cap Point.
Nov. .	Str. Turret Chief	Ran ashore in gale, broadside against rocks, and broke in two amidships; badly pounded by seas; total constructive loss	Copper Harbor, Lake Superior.
Nov. .	Str. Fulton	Ran ashore owing to low water; repairs estimated at $2,500	Bar Pt., Lake Erie.
Nov. .	Str. Wm. Nottingham	Ran ashore on rock in gale; entire cargo lost; released on Nov. 18 and temporarily repaired at Sault; towed to Toledo to be docked; rudder, shoe and bottom badly damaged; damage estimated at $75,000; three lives lost	Near Parisian island, Lake Superior.
Nov. .	Str. Major	Abandoned by her crew in gale and brought to Soo by tugs on Dec. 15; constructive total loss	Near Whitefish Pt., Lake Superior.
Nov. .	Str. G. J. Grammer	Ran ashore; released; damage estimated at $1,500	Lorain, O.
Nov. .	Str. F. G. Hartwell	Ran ashore in storm; cargo hold and engine room full of water; released and towed to Sault on Nov. 15 and then towed down lakes to Toledo to be docked; 70 plates, rudder and shoe damaged; repairs estimated at $30,000	Iroquois Pt., Lake Superior.
Nov. .	Str. Northern Queen	Ran ashore in storm; released on Nov. 17 after lightering 500 tons package freight; arrived at Buffalo on Nov. 22 for repairs; damage estimated at $25,000	Kettle Pt., Lake Huron.
Nov. .	Str. J. T. Hutchinson	Stranded in storm; released on Nov. 16 and went to Sault where big rock, imbedded in her bottom, was removed; docked at Lorain; repairs estimated at $40,000	Point Iroquois, Lake Superior.
Nov. .	Str. Pontiac	Bottom damaged in storm; arrived at Manitowoc on Nov. 20 for repairs; damage estimated at $7,500	Simmon's Reef, Straits of Mackinac.
Nov. .	Str. Edward Buckley	Ran ashore; released Dec. 10 and taken to Port Huron to be docked	Harbor Beach, Lake Huron.
Nov. .	Str. D. O. Mills	Ran ashore in storm; released herself; docked at Ecorse; repairs estimated at $45,000	Harbor Beach, Lake Huron.
Nov. .	Str. Matthew Andrews	Ran aground in storm; floated on Nov. 12; repaired at Toledo; damage estimated at $2,500	Corsica Shoal, Lake Huron.
Nov. .	Str. Col. J. M. Schoonmaker	Ran ashore; released by tugs; slightly damaged	Mission river.
Nov. .	Str. J. M. Jenks	Ran ashore; released after lightering 28,000 bu. grain; docked at Lorain on Nov. 17; 17 plates damaged; repairs estimated at $25,000	Near Midland, Georgian bay.
Nov. .	Str. R. P. Ranney	Broke one bucket off her wheel; stopped at Soo and later proceeded	————
Nov. .	C. F. Ann Arbor No. 4	Ran ashore; released	Green Island, Lake Michigan.
Nov. .	Bge. Athens	Ran aground; released after lightering	Livingstone channel.
Nov. .	Str. Victory	Ran ashore in storm at downbound entrance; released after lightering part of cargo; damage estimated at $12,000	Livingstone channel.
Nov. .	Str. Matoa	Driven ashore in storm; abandoned as constructive total loss; 350 tons of coal cargo lightered	Point Aux Barques, Lake Huron
Nov. .	Str. H. B. Hawgood	Ran ashore in storm; damage estimated at $7,000	Weis Beach, Lake Huron.
Nov. .	Str. W. G. Pollock	Ran aground at entrance; released herself; damage estimated at $5,000	Lake St. Clair Ship Canal.
Nov. .	Lightship No. 82	Foundered. Six lives lost	Point Abino, Lake Erie.
Nov. .	Bge. Sidney G. Thomas	Broke adrift from moorings in storm and ran aground	Cleveland.
Nov. .	Bge. Alex. Holley	Broke from moorings in storm and hit a lumber pier	Cleveland.
Nov. .	Bge. Jenney	Broke from her moorings in storm	Cleveland.
Nov. .	Str. B. F. Berry	Lost both anchors; returned to Sault	Lake Superior.
Nov. .	Str. State of Ohio	Broke from her moorings in storm, demolishing several motor boats anchored alongside and tearing great hole in her side and crushing her stern	Cleveland.
Nov. .	Tug Kittie Downs	Hit by Str. State of Ohio and upper works demolished	Cleveland.
Nov. .	Str. L. C. Waldo	Ran ashore in storm and broke in two; constructive total loss	Manitou island, Lake Superior.
Nov. .	Str. H. M. Hanna Jr.	Thrown upon reef and broke in two amidships; constructive total loss; cracked clear across deck and break extends below water line on both sides	Point Aux Barques, Lake Huron
Nov. .	Str. H. B. Smith	Foundered in storm; 23 lives lost	Lake Superior.
Nov. .	Str. Hydrus	Foundered in storm; 24 lives lost	Lake Huron.
Nov. .	Str. Argus	Foundered in storm; 24 lives lost	Lake Huron.
Nov. .	Str. John A. McGean	Foundered in storm; 23 lives lost	Lake Huron.
Nov. .	Str. Regina	Foundered in storm; 20 lives lost	Lake Huron.
Nov. .	Str. Geo. G. Crawford	Lost her anchors in storm	Lake Huron.
Nov. .	Str. Peter White	Thirty hatch covers battered to pieces in storm; docked at Ashtabula Dec. 1 for repairs to bottom and other damage	Lake Superior.
Nov. 9	Str. J. H. Sheadle	After quarters demolished in storm	Lake Huron.
Nov. .	Str. Leafield	Reported ashore but when searched for it was believed she slid off rocks and sank; total loss. 18 lives lost	Angus island, Lake Superior.
Nov. 9	Str. Cornell	After quarters smashed in storm; stopped at Sault for repairs	Lake Superior.
Nov. .	Str. Wexford	Foundered in storm; 18 lives lost	Foot of Lake Huron.
Nov. .	Str. Huronic	Ran ashore and was badly pounded for three days; damage estimated at $30,000	Whitefish point, Lake Superior.
Nov. .	Str. A. E. Stewart	Ran ashore in storm; damage estimated at $2,000	Whitefish bay, Lake Superior.
Nov. 9	Str. Acadian	Ran ashore in storm; large hole in bottom; released on Nov. 19 and temporarily repaired at Sarnia; docked at Ecorse Dec. 13; damage estimated at $30,000	Thunder bay, Lake Huron.
Nov. .	Str. Isaac M. Scott	Foundered in storm; 28 lives lost	Lake Huron.
Nov. .	Str. Chas. S. Price	Foundered in storm; 28 lives lost	Lake Huron.

Nov. .	Str. James Carruthers	Foundered in storm; 22 lives lost	Lake Huron.
Nov. .	Bge. Halsted	Foundered in storm	Green bay, Lake Michigan.
Nov. .	Str. Black	High wind tore out her deck winches and as anchors could not hold her she pounded against concrete wall of dock, sustaining heavy damage	Gary, Ind.
Nov. 9	Str. Rhoda Emily	Beached in storm; released Dec. 11 and later docked at Detroit; badly damaged	Harbor Beach, Lake Huron.
Nov. .	Bge. Plymouth	Foundered in storm; seven lives lost	Gull island, Lake Michigan.
Nov. .	Str. Centurion	Badly pounded in storm and lost forty hatch sections	Lake Huron.
Nov. .	Str. Meaford	Stranded in storm; slightly damaged	St. Mary's river.
Nov. .	Str. Scottish Hero	Stranded in storm; slightly damaged	Lake Superior.
Nov. .	Str. Saxona	Stranded in storm; damage estimated at $1,500	Lake St. Clair.
Nov. 16	Str. G. W. French	One of columns of engine broke; picked up by Str. J. S. Ashley and towed to Duluth; repaired at Superior ship yard	Fourteen Mile Pt., Lake Superior.
Nov. 18	Str. Mapleton	Ran ashore in heavy fog; released on Nov. 20 and proceeded	Drummond island, St. Mary's river.
Nov. 19	Str. Capt. Thos. Wilson	Ran aground on west bank in heavy fog; released on Nov. 22 after lightering large part of her stone cargo; one tank leaked; twelve plates damaged; docked at Toledo	Livingstone channel.
Nov. 19	Str. Andrew Carnegie	Struck east bank in heavy fog; released	Livingstone channel.
Nov. 20	Str. A. P. Wright	Ran ashore in fog; released on Nov. 21, uninjured	Grosse Point, Lake Michigan.
Nov. ..	Tug Kenosha	Rolled over; floated on Nov. 21	Chicago.
Nov. ..	Str. Neptune	Broke her rudder while backing into a slip	Erie, Pa.
Nov. ..	Str. Hecla	Ran ashore; released Dec. 6, after being on about two weeks; steamer in pretty bad shape	Near Alexandria bay.
Nov. 24	Bge. Parsons	Foundered in gale; loaded with coal; crew saved	Off Oswego, Lake Ontario.
Nov. 23	Str. W. H. Wolf (Wood)	Struck, damaging her bottom; water poured into her so rapidly that she turned into Amherstburg channel to Callam's bay, resting on sandy bottom; grain cargo damaged; floated Nov. 6 and patched up; docked at Cleveland Dec. 17	Livingstone channel.
Nov. 24	Str. City of Bangor	Struck on east bank while two lights were out; punctured 1 and 2 compartments on port side; docked at Toledo	Livingstone channel.
Nov. 26	Str. I. W. Nicholas	Ran hard aground with 150,000 bu. flax; deck cracked across and breaks on port and starboard sides through which part of cargo ran out; constructive total loss; released Dec. 14 and towed to Alpena for temporary repairs; to be docked at Port Huron	Off North Point, Lake Huron.
Nov. ..	Str. Hazard	Ran ashore; loaded with cement; released and towed to Port Huron for repairs	Off Rockport, Lake Huron.
Nov. 29	Str. Gogebic	Ran aground while trying to enter river	Thunder bay river.
Nov. 29	Str. Codorus	Ran on rock bottom; released on Dec. 1 and went to Mackinac island, reloaded lightered flour cargo and sailed on Dec. 2	South Graham Shoal.
Nov. 30	Str. Huron	Struck lightly and punctured one tank	Off Point Aux Barques, Lake Huron.
Nov. 30	Tug James H. Martin	While moored at dock, filled and sank	Menominee, Mich.
Dec. .	Str. Manitou	Ran ashore	Killarney, Lake Huron.
Dec. 7	Str. F. C. Ball	Collided with Str. Sierra; several plates cracked on port side in line with her anchor	Mud Lake.
Dec. 7	Str. Sierra	Collided with Str. F. C. Ball; damaged on starboard side	Mud Lake.
Dec. 8	Str. James H. Shrigley	Struck bridge draw and stripped buckets off her wheel; collided with wrecker Manistique	Alpena, Mich.
Dec. 8	Str. Manistique	Hit by Str. Shrigley and sprung a leak	Alpena, Mich.
Dec. .	Str. Edward Buckley	Ran aground; released on Dec. 10 and went to Port Huron to be docked	Harbor Beach, Lake Huron.
Dec. 8	Str. W. G. Pollock	Windows broken in by heavy seas in storm	Lake Superior.
Dec. 13	Str. A. E. Nettleton	Badly damaged by fire; pilot house, observation room, captain's room and passenger quarters destroyed	Milwaukee, Wis.

Index to Advertisements